Railroad Age Gazette

INCLUDING THE RAILROAD GAZETTE AND THE RAILWAY AGE

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CONTENTS

EDITORIAL:
Massachusetts Trolley Holdings..... 363
Train Despatching by Telephone on the Burlington 363
The Growing Problem of Adjusting Rates to Conditions 364
One View of Railroad Capitalization.... 365
Pennsylvania Company..... 366
New Publications 367

ILLUSTRATED:
Sir Robert G. Reid..... 379
Early Brake Tests in England..... 384
Water Purifying Apparatus for Locomotives 389
Locomotives of Eastern Ry. of France. 390
Lubrication of Driving Wheel Flanges.. 396
The Central of New Jersey Air Brake Instruction Car 397

LETTERS TO THE EDITOR:
Comparative Equipment Summaries.... 369
Respectfully Referred 369
"Artistic" Reports of Freight Rate Increases 369
Locked Cabinet for Train Orders..... 369
Accounting Borrowed Equipment..... 370
Taking Chances 370
Cast Iron Car Wheels..... 371

MISCELLANEOUS:
Elastic Insertion-Plates in Permanent Way 374
Poor's Manual for 1908..... 375
American Railway Association..... 375
Master Car Builders' Tests for Brake Shoes 376
Despatching Trains by Telephone..... 377
Doings of the Massachusetts Legislature 378
Coal Briquettes and Their Use in Railroad, Marine and Domestic Service... 379
Six New Federal Laws..... 395
Train Accidents in May..... 396
Foreign Railroad Notes:
Russian Railroad Operation..... 378
Southwest Africa Railroad..... 379

GENERAL NEWS SECTION:
Traffic News 400
Equipment and Supplies..... 406
Railroad Officers 408
Railroad Construction 409
Railroad Financial News..... 410

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The fact that the suit brought by the department of justice against the New Haven company is of a federal character should not obscure the importance of the Massachusetts State court decision bearing upon the corporation's control of trolley lines and investment in Boston & Maine shares. That case, too, is of vital import in the railroad jurisprudence of the whole country. In essence, it is a battle of charters and of jurisdictions. Under its Connecticut charter the New Haven company can do almost anything and in its own way. Under its old Massachusetts charter it can do, relatively speaking, almost nothing, and what it does do it must do in the commonwealth's way. The holdings of the various securities of the corporation are much larger in Massachusetts than in Connecticut; yet during the last ten years it has done, under its Connecticut authority, probably fifty things of importance forbidden under the Massachusetts statutes. Where in such cases is the line of state jurisdiction to be drawn? Can a railroad corporation do in one state what is forbidden in another when it holds charters in both? Can it do in Massachusetts under a Connecticut charter what a Massachusetts railroad corporation under a Massachusetts charter cannot do? Some legal authorities will perhaps hold that the double charters are separative and applying to their respective states. That Massachusetts cannot, for example, forbid the New Haven's purchase of a Connecticut trolley. But such a theory obviously does not bear on the general acts of a double chartered corporation, such, for instance, as the issue of new stock or general mortgage bonds. On the other hand, there is the theory that holds when a railroad corporation accepts a state charter it accepts it radically and sweepingly as restricting *all* its acts. If it holds six different charters in as many states each applies in all. Finally, there is the question of basic rights of purchase or ownership at common law on the part of a railroad corporation and its stockholders, saying nothing of the technical status of that comparatively modern device, the holding company, often organized expressly to dodge charter restrictions. All these questions, old and new, raise a great case for the highest federal tribunal, not modified in principle by the fact that Massachusetts has let a third of a century go by without bringing them to legal test until a few days ago, and has for that time slept on her rights, if such rights there are. The prospective compromise of the dispute outside the courts, merely from the local and state viewpoint, is probably more expedient and sane. But a legal decision at Washington would have immense and enduring values in a case so clearly raised between two contiguous New England states, with railroad policies and principles so widely divergent and crystallized into law.

Mr. Ryder, of the Chicago, Burlington & Quincy, speaking at the Montreal convention of the railroad telegraph superintendents, makes the most satisfactory report on telephone train despatching that has yet appeared, and we reprint his paper in this issue, practically without abridgment. Mr. Ryder not only finds complete satisfaction in the use of telephones for despatching, but proposes to use them for ordinary messages as well, and even for paid (Western Union) messages. There has never been any doubt of the availability of the telephone for train despatching since Mr. Hammond, of the Boston, Revere Beach & Lynn told how he had used it on that road fifteen years ago (*Railroad Gazette*, Dec. 30, 1892; Sept. 1, 1899), but all of our principal railroads continued for years to act as though there were doubts. This conservatism was due in large measure, of course, to the feeling that while, perhaps, the telephone might on the whole be as good as the telegraph, it would not be any better; and the telegraph was established and was satisfactory. But the telephone is not merely equal, it is better. Mr. Ryder's experience, unlike most of that which has been reported heretofore, is sufficiently extensive to warrant us in accepting this statement. The need of having careful operators and of giving them a thorough training exists now just the same as it did before; but with men of conscience and some stability of character, the telephone saves time in calling, saves time in repeating back the orders, and makes it far easier for the superintendent to find competent station attendants. The other advantages named by Mr. Ryder are less important, but equally easy of attainment. The availability of telephones for block signaling has already been shown, and their use on over 3,000 miles of road was recently noted in these columns. If Mr. Ryder's statement, that his

telephone circuits are troubled by rain storms less than are the telegraph circuits, shall be confirmed by telegraph superintendents generally, the useful, simple and time-honored "Morse" will indeed have to look out—not for its laurels, for they are secure in the memories of three generations of railroad men—but for its bread and butter. No longer can the man who "frites gerse" compel a whole division to bow down to him.

THE GROWING PROBLEM OF ADJUSTING RATES TO CONDITIONS.

Shippers and their spokesmen are using the industrial and commercial depression as their main argument against the proposed advance in freight rates. But they would be opposing it just as strongly were the country at the height of prosperity. Shippers are almost unanimous that there is never an opportune time for a general advance in rates, and while most of them concede that advances on particular commodities may at times be justified, few can ever be persuaded that the time is ripe for increases in the charges on their own commodities. And they usually succeed in arraying railroad regulating authorities and public sentiment on their side. The difficulties that in consequence are encountered by railroad officials in adapting schedules to varying transportation and commercial conditions are greater now than they ever were before, and they are rapidly increasing. Whether the proposed advance now being discussed shall be made or not, the situation of affairs that is being developed by the attitude of shippers and the public, so strikingly exemplified by recent utterances in the newspapers and in resolutions adopted by shippers' conventions, presents a problem of considerable importance. There is a steadily growing tendency to reduce the elasticity of rates. If every advance be successfully resisted, it must be only a matter of time until every reduction will be stubbornly opposed. Reasonable stability of rates is eminently desirable, just as is reasonable stability of prices of commodities, but inflexibility of schedules would be unmitigatedly harmful. For the price of transportation to be almost immutable, while the prices of all other things are constantly fluctuating, is an economic anachronism.

The current agitation against advances in freight rates is being led chiefly, as was the agitation a year ago in favor of wholesale reductions, by the traffic managers of commercial organizations and large industrial concerns. There are numerous industrial traffic managers, many of whom have had railroad experience, who are intelligent enough to recognize and broad enough to admit that the interests of railroads and shippers in the long run are identical; but, unfortunately, many of them think that they can best serve their own interests and those of their employers by constantly antagonizing and seeking to circumvent the railroads. They talk much of "co-operation," but they regard with suspicion any kind of co-operation that will benefit the carriers. Certain industrial traffic managers use violent language regarding the proposed advance in rates who a few years ago would have regarded an increase with complaisance, which suggests that they knew then that their concerns would not have to stand the advance, while they know now that they must pay the published tariff rate. The real leaders of commerce and industry would take an intelligent and farsighted view if they could be induced personally to carefully study the railroad situation. They would see that while it may be to their immediate interest to keep their freight bills as small as possible, in both good times and bad times, it is much more vital to them that all obstacles to the adequate development of the country's transportation system should be removed. But, occupied with numerous duties and problems, they too often leave the attitude of their concerns and of their organizations toward the railroads to be determined by others. Unfortunately, also, the traditional railroad arrogance in handling rate questions has not yet entirely disappeared. Many railroad traffic men forget that it is usually better for the carriers that their representatives should confer courteously, openly and fully with shippers before deciding upon advances in rates than to war with them through the newspapers and before commissions after advances have been determined upon.

The wise course for both responsible business men and responsible officials of railroads to take under existing conditions is clear. They must, if they are to promote the best interests of both sides, seek to get each other's points of view. They must show more regard for each other's susceptibilities, rights and interests. They must recognize the fact that when railroad rates in this country entirely cease to be made on commercial principles, and come to be exclusively the issue, as our tariff duties are, of more or less inane daily newspaper discussion and of struggles of industry against industry, class against class, section against section, and party against party, they will be as ill-adapted to commercial and industrial needs as are railroad rates in Germany, or France. It has been proposed to submit to the Interstate Commerce Commission the question of whether the proposed advance in rates is justifiable. In France when a railroad wishes to advance or reduce a rate it must submit its proposal to the Minister of Public Works. Copies of the proposal are sent to the Commercial Control Department and to the prefect of every district through which the lines of the road run. Each prefect communicates it to every Chamber of Commerce in his department. The proposal, with the comments made upon it by those to whom it has been submitted, must subsequently be examined by the Inspecteur de l'Exploitation Commerciale de la Conscription, the Controleur-General, and the Inspecteur-General du Reseau. All this is preliminary to the proceedings of the Comité Consultatif des Chemins de Fer, one of the minister's four advisory committees on railroad affairs. This committee will probably refer the matter to a sub-committee. Finally, the whole thing will be referred back to the Minister of Public Works for final determination. There is a case on record of a railroad applying early in the spring for permission to grant a reduced rate to a summer resort and having its application granted in October. If the railroad officials and the business men of this country will but persevere long enough in carrying all their difficulties to public authorities they may succeed at last in making the readjustment of rates as protracted a labor of circumlocution here as it is in France.

While a better understanding, which would in the long run inure to the profit both of railroads and of shippers, would doubtless be reached if proper efforts to that end were made by the leading men on both sides, controversies will always arise the results of which will finally be determined by public opinion. Railroads within recent years usually have been worsted in their struggles with politicians and predatory shippers, even when they have seemed clearly in the right. They constantly have been outgeneraled. We believe and hope that the time will soon forever be past when railroads will use corruption as a weapon against injustice. We believe and hope that the time is here when a majority of managers of railroads in every part of the country fully realize that in order permanently and effectively to protect railroad properties, thorough-going efforts must be made to win away the upright leaders of public opinion in every community from alliance with those who seek to profit by inveighing and legislating against the corporations. The first move to this end ought to be the purging of railroad management of suspicious and dishonest practices. The public should be taken into the confidence of railroad officers, and no effort should be spared to make clear the exact situation with which they are confronted; to demonstrate that the methods of making rates are fundamentally sound, and that the public

has as much reason for wishing to see a railroad make large profits as it has for wishing to see manufacturing or mercantile concerns highly prosperous.

ONE VIEW OF RAILROAD CAPITALIZATION.

It seems to be the popular impression that if the capitilization of a railroad exceed its "physical valuation" the amount of the excess is "water." If this conception be correct it has been and still is impossible to build a railroad in the United States without water in its capitalization.

The theory of railroad capitalization that was generally accepted in this country until the recent academic discussions, is expressed by Wellington in his "Economic Theory of the Location of Railways" (Fifth Edition, Engineering News, 1893). That which was needed in the early days was the railroad. What profit could be obtained from operation in this part of the country or in that part of the country was unknown. It became the custom to build a railroad with the proceeds of bonds, which were an immediate lien upon the property, and to issue stock to those who took the risk of the venture that they might reap the profit should the enterprise in the course of time yield a greater return than the interest on the bonds. In the very early days the overwhelming need for a means of communication and transportation sometimes led to cash being paid for bonds at their full value, but more often the element of hazard in the future of the railroad led to even the bonds being sold at a discount and stock being issued as a bonus to those who placed their money in the bonds, which were themselves more or less of a venture, notwithstanding their prior claim upon the property.

That is, in order that a railroad might be built, the projectors were obliged to bind the company to pay interest on a bonded indebtedness of $100, for which they had received in actual cash but $95 or $90, or less, as the case might be. The time required to build a railroad, provide it with equipment, and bring it into operation has seldom been less than two or three years, and has usually been much longer. The payment of interest on the bonds has, of course, been necessary during this period of utter unproductiveness.

Moreover, railroad building, in common with about all other projects of mankind, usually overruns the estimate of cost. This was conspicuously the case with the Great Western of England, the London & Birmingham, and with nearly every one of the railroads of the United States. From an editorial survey in *Poor's Manual* for 1899 we learn that "the works first built were cheap and rude structures, adapted neither to high speeds nor heavy trains, and formed a most striking contrast to the almost perfect works of the present day. The estimated cost of many of the most important lines in the country did not equal one-half their annual receipt at the present day. That of the Erie Railroad was $6,000,000. A revised estimate made as late as 1841, after considerable progress had been made with the work, put the cost of the road at only $9,000,000. The inadequate estimates made in almost every case were a fruitful source of future embarrassment, while the imperfect structure of most of the roads not only greatly restricted their traffic, but involved heavy losses from their reconstruction, which was in almost every case rendered necessary. The earlier roads, instead of possessing, as at present, an annual traffic exceeding in value many fold their cost, were a heavy burden upon the capital and industry of the country. In many of the states, particularly in the western and the southern, large sums were expended upon lines which were wholly abandoned. Still larger sums were wasted in attempts to construct canals and in extensive systems of banking, which were set on foot in nearly all the states." From "An Historical Note on Early American Railways," by Charles H. Chandler, we learn: "It was estimated that a single line of rails over the route contemplated (from Boston to Lowell) would require an expenditure of $168,000, or $7,100 for each of the 23½ miles to be covered. . . . Before completion the originally estimated cost had increased to $1,800,000."

After a railroad is completed, that is, after it has nominally been completed, there is always a period of seasoning. New embankments settle to such an extent that they have to be restored to their grades. The sides of the cuts slough in under the action of the elements, and the ditches have to be cleaned out. The expenditure to restore the levels that have thus been depressed, the restoration of the banks, their riprapping for protection against the wash of the streams, and the general adjustment of the road to its use, that is, the expenditure for what the engineers call "impact and adaptation," is often as much as 10 per cent. of the cost of the road.

Even after a railroad has been completed and the necessary expenditures made for impact and adaptation, it has to struggle along for an indefinite period, usually at least two or three years before its personnel has been welded into an efficient organization, and before traffic in profitable volume has come to its rails.

A current example of this working out of finance and construction that may be followed with much interest is afforded by the Western Pacific, designed to extend from Salt Lake City to San Francisco. The sale for this project of $50,000,000 of bonds at 90 was at the time pronounced a brilliant achievement. From the $45,000,000 of cash received it was necessary to set aside $7,500,000 to pay interest at 5 per cent. for three years, pending the completion of the road. That is, of the par value of $50,000,000 of bonds but 75 per cent. was available for construction, 25 per cent. being invested in the original discount, and the interest during the three years of construction. In other words, the amount consumed by discount and interest during construction is one-third, or 33⅓ per cent. of the amount actually available for construction. The inadequacy of this first mortgage has made it necessary to sell $15,000,000 worth of 6 per cent. notes to provide additional funds. It is now clear that the road will not be completed and in full operation in the three years allotted, and it is yet too early to even guess at the comparison between the engineer's estimates and final costs.

Such experience is but typical of that which nearly every one of our railroads went through during its infancy. Had the current cry of the populace and the politicians that the capitalization of a railroad should be no greater than the actual amount invested in its construction been the basis from the beginning, there would have been no such progress in the building of railroads as this country has known.

The narrators of the traditional profits of the cliques that unloaded bonds at nigh prices and of the construction companies of the past decades, neglect to include the instances of projectors who have had to raise funds on their own responsibility to make good underestimates of engineers, and have become bankrupt during the period of waiting. The vast majority of the railroads of this country have been in the hands of a receiver at one or another period of their history, and every one of them has had to be rebuilt time and again, as increasing traffic has compelled the adoption of larger cars and more powerful locomotives, which in turn have necessitated heavier tracks and stronger bridges. In the road as it stands to-day is therefore not only the original capital, but additional capital investment after capital investment, which would never have been made under the theory that the capitalization should never exceed the actual cost of construction at any given time.

It is this unending necessity for increased facilities for extension and expansion, that is strangled by such experiments as the state of Massachusetts has been conducting for the last thirty years or more. Even after the traffic of a road has so developed that it can pay dividends which send the stock above par, investors as a rule will not invest in additional issues of stock at the market price of the stock outstanding. The

stock outstanding has attained a status of which new stock, with rare exceptions, cannot be assured from the start. Even with extensions of an existing road there is a period of construction, a period of expenditure, because of impact and adaptation, and even a period of waiting for additional traffic development to the extent necessary to return profit on the new investment.

Massachusetts was among the first, if not the very first, of the states to impose restrictions upon capitalization and dividend. The long-ago decreed limitation of the rate of dividend to 10 per cent. deprived the Boston & Albany Railroad, which had early attained that rate of profit, of any incentive toward the extension of its line and the expansion of its business. It therefore remained a single-track railroad for a generation, although the crying need of Boston was for a great through-line to the west.

In 1871 the state of Massachusetts prohibited the issue by a railroad company whose stock was selling above par of a new issue to its stockholders at par. One effect of this was to restrict the dividend rate, which had been limited to 10 per cent. on the par value, to $10 on the market value, thereby reducing the dividend on the new investment at the market price to perhaps 8 per cent. or 7 per cent. In criticism of this the state's own railroad commission said that "less inducement is thus held out to private capital to seek investment in the railroad system of Massachusetts than in any other state of the Union."

This act was repealed in 1878 and the status existent prior to 1871, under which new stock could be issued to stockholders at par, was re-established. In 1893, however, it was decreed that when a railroad company increased its stock by an issue exceeding 4 per cent. of its existing capital stock, the issue should be offered at its market value as determined by the state board of railroad commissioners. Apropos of this enactment, that board observed: "Any cause of legislation that is calculated to reduce the revenue of a corporation to a point which does not admit of an ample and even liberal return, and which does not, moreover, allow a margin of profit sufficient for the maintenance of a high standard of construction and equipment, is not only unjust but impolitic, as tending to discourage the investment of capital in legitimate railroad enterprise, and to disable the corporation from rendering the best public service." This is the law of which the Massachusetts Commission on Commerce and Industry says: "There seems to be no doubt that it is working badly," that it "is making it difficult to raise money needed for the proper development of our transportation facilities."

The moral is obvious: if a project is to enlist capital it must offer inducement to investors. If the project be untried, the inducements must be greater than a prospective return no larger than that yielded by an established enterprise. Greater inducements than a secured return on money at the market rate must be held out even for an extension and expansion of an established enterprise. In a developed community, in times of easy money, such inducement may be offered by a new issue at par by a company whose existent issues command a premium. In undeveloped portions of the country, where the hazard is greater, such inducement oftentimes may be given only by an issue of stock, or even of bonds, at less than par. When business is on the boom and new construction most needed, practically all securities must be sold below par, because of the intense competition for the tightening supply of money.

In the past new enterprises have often been swamped, projectors and investors alike losing their money. When in the course of time an enterprise proves successful it would seem unrighteous that its fair and reasonable profits be reduced by legislation, unless the policy be also adopted that projectors and investors should be reimbursed by legislation for their losses. It would seem no more than fair that if the state prohibits the issue of new stock of an enterprise except at a premium, or even at less than par, it should protect the market value from falling, and reimburse the stockholders in case the value of the stock falls to less than par. Is not this the *reductio ad absurdum?*

The endeavor by legislation to limit capitalization and rate of dividend is, of course, akin to the plan of the single taxer to tax away the "unearned increment" from the value of land. The increase in the value of land is, however, more often earned than unearned. The favorable location of a railroad may be more than offset by incapable administration, and skilful management may bring an augmenting traffic to a road less favorably located and cause it to be carried with profit. If the profit is to be limited to a "reasonable return upon the actual value," is the incapable management to be lifted to the level of the skilful, or is the skilful to be degraded to the level of the incapable?

Suppose, as may easily be the case, that a railroad in a locality of comparatively scant traffic cost the same, or practically the same, as a railroad in a region which has developed comparatively dense traffic. The latter road will use more locomotives, more cars, run more trains, burn more fuel, use more supplies of every kind, require a more extended administrative staff which must train, direct and discipline a greater force of employees. Is it fair that the profit of this latter road be whittled down to a level with that of the former?

In manufacturing and mercantile establishments the profit is counted upon the amount of business done, the value of the plant being but one factor. In a city there may be a factory transforming raw material into products which command a price of $100,000. In that same city may be another factory engaged in the same industry, with plant costing exactly the same, that transforms double the quantity of raw material into double the quantity of products, for which it obtains $200,000. Is the latter factory to be allowed no greater profit than the former? If one factory be built after an ill-adapted design, by wasteful methods, and the other be skilfully and economically constructed, is the latter to reap no greater profit than the former?

Is it not fair that the same reasoning and the same principle within just limits apply to a railroad? If so, the securities of the better built and better operated railroad will rise above par. Their value will depend upon the earning power of the railroad and not upon its physical valuation. Thus earning power is the just basis for capitalization. Doubtless the public, through lower rates, should participate in the cheapening cost of transportation that, other things equal, follows increasing density of traffic. As a matter of fact, in 1905 the railroads carried 115.84 per cent. more traffic for 93.65 per cent. more money than in 1895, the volume of traffic, therefore, increasing in 22.19 per cent. greater ratio than the compensation for carrying it.

PENNSYLVANIA COMPANY.

The Pennsylvania Railroad owns and operates the lines east of Pittsburgh, and it also owns all the stock of the Pennsylvania Company. The Pennsylvania Company holds control of all the Pennsylvania Lines West. It also owns large blocks of securities of allied roads like the Baltimore & Ohio and the Norfolk & Western. The Pennsylvania Company in 1907 operated directly 1,340 miles, made up of 10 different companies of which the principal is the Pittsburgh, Fort Wayne & Chicago, an almost direct route between Pittsburgh, Pa., and Chicago, Ill., by way of Massillon, Ohio, and Fort Wayne, Ind. This is the route of the Pennsylvania's 18-hour train between New York and Chicago. Besides this, the Pennsylvania Company operates roads from Pittsburgh to Ashtabula, Ohio, Cleveland and Toledo, on the shore of Lake Erie. It controls the Pittsburgh, Cincinnati, Chicago & St. Louis, constituting the Southwest system, which operates 1,427 miles, and in addition some 13 other companies of which the Vandalia and Terre Haute & Peoria are the largest. The whole mileage of the lines west of Pittsburgh and Erie owned, operated, controlled by or associated in interest with the

Pennsylvania Company amounts to 5,098 miles. The present review, however, is to deal only with results on the 1,340 miles operated directly by the Pennsylvania Company.

The 1907 annual report reads more like a 1906 report than like the reports of the majority of other railroads for the last year. Gross earnings were $51,000,000, an increase of over $5,000,000, and net earnings were $35,400,000, an increase of about $4,000,000 over the previous year. The greatest gain was from freight traffic, which was $40,600,000, an increase of 11 per cent. Tonnage carried in 1907 was 89,300,000 tons, an increase of 9.23 per cent. over 1906, and during the same period ton mileage increased by 11.80 per cent. From this traffic the company earned 0.60 cents per ton per mile with expenses of 0.42 cents per mile, leaving it net earnings of 0.18 cents. This is a decrease of .01 of a cent per ton per mile from the net earnings in 1906, gross earnings remaining exactly the same and expenses having increased by .01 of a cent. It is interesting to note that the average earnings per ton per mile on all lines operated directly by the Pennsylvania Company was precisely the same as the earnings per ton per mile on the Pittsburgh, Fort Wayne & Chicago, but this does not hold true for passenger traffic. The number of passengers carried one mile on all the lines operated directly by the Pennsylvania Company was 387,000,000 in 1907, being a gain of 12.43 per cent. over the previous year, and earnings per passenger per mile were 1.87 cents in 1907, a decrease of 0.12 cents from the previous year. Expenses per passenger per mile were 2.17 cents, a decrease of 0.15 cents from 1906, so that the net loss per passenger per mile in 1907 was 0.30 cents, a decreased loss of .03 of a cent per passenger per mile. The earnings per passenger per mile on the Pittsburgh, Fort Wayne & Chicago, the fast line of the Pennsylvania Company, were 1.89 cents, a decrease of 0.11 cents, while expenses were 2.08 cents, a decrease of only .07 of a cent, so that the loss per passenger per mile in 1907 was 0.19 cents, an increase of .04 of a cent over 1906.

Beside these earnings from operation which we might have expected from the showing of other roads to be far less favorable than they actually were, the Pennsylvania Company received from dividends and interest on investments $11,800,000 an increase of 54 per cent. over the previous year. There was not, however, any interest general account received in 1907, so that the total income received from other sources than operation increased but 28 per cent., reaching $11,850,000 in 1907. During the year the principal changes in the income received from securities were as follows: $807,000 was received from the Baltimore & Ohio common stock, an increase of about $200,000. There was no income from Chesapeake & Ohio stock in 1907, while in 1906 there was $40,000. On the other hand, in 1906 the Pennsylvania Company received no income from its Oregon Short Line securities, while in 1907 the securities paid $1,122,000 in interest.

The $50,000,000 Pennsylvania Company 4½ per cent. collateral improvement notes matured November 1, 1907, were paid out of cash on hand and the proceeds of the Oregon Short Line notes, which were held in the treasury. The balance sheet makes as satisfactory a showing, as the net earnings and the gross income. Current assets in 1907 were $29,000,000, again $19,000,000 on December 31 of the previous year, and the current liabilities were $13,000,000 on December 31, 1907, against $15,000,000 on the same date of the previous year. But as the greatest increase in current assets comes under the head of "Money due by leased roads for betterments," the comparison of current assets may not be as favorable as would at first glance appear.

Maintenance of way and structures cost $6,966,000 in 1907, an increase of $758,000. In 1907 this is an average of $5,199 per mile of road operated, against $4,636 per mile of road in the previous year. The unit costs of repairs of equipment were as follows: $2,978 per locomotive in 1907, against $2,908 in 1906; $1,078 per passenger car in 1907, against $834 in 1906, and $108 per freight car in 1907, against $116 in 1906. The decrease in cost of maintenance per freight car may be due to the fact that 1,888 cars were built to fill vacancies or transferred from other classes during 1907, and the total number of cars available for service December 31, 1907, was 36,210, an increase of 682 cars over the previous year. The tonnage of the different classes of freight carried shows only one notable change. There were 544,512 tons of anthracite coal carried. This is an increase of 25 per cent. over the previous year. The tonnage of bituminous coal was increased from 27,627,245 tons in 1906 to 32,249,455 tons last year. The average trainload last year was 499 tons, as against 479 tons in 1906.

Work on the elevation of tracks on the Pittsburgh, Fort Wayne & Chicago in the city of Chicago was continued throughout the year, and involved the rebuilding of the engine house and shops at Fifty-fifth street. Very little work, however, was done on the track elevation of the Cleveland & Pittsburgh in Cleveland, but a large amount of work was done on an interchange yard for handling the lake coal and ores near Bedford, Ohio, and the docks and ore and coal handling appliances at Ashtabula Harbor were added to and improved. The car ferry between this place and Port Burwell, on the Canadian side of Lake Erie was in operation from April 1, 1907, to the end of January, 1908. Over 6,000 cars containing 260,000 tons of coal were thus carried into Canada. New contracts with the Western Union Telegraph Company provide for the operation of the telegraph on the Pennsylvania Company's lines for 20 years, beginning October 1, 1907.

The following table gives the results for 1907 and 1906:

	1907.	1906.
Mileage worked	1,340	1,339
Freight earnings	$40,626,868	$36,323,405
Passenger earnings	7,574,324	7,078,927
Gross earnings	51,337,433	46,036,806
Maint. way and structures	6,966,354	6,208,046
Maint. of equipment	9,078,618	7,799,587
Traffic	749,971	688,018
Cond. transportation	17,748,292	15,993,649
Operating expenses	35,404,908	31,480,585
Net earnings	15,932,325	14,555,221
Net income	9,896,487	8,933,888
Dividends	4,200,000	3,600,000
Redemption loan crtfs and contributions sinking funds	1,676,966	1,677,481
On acc't principle of car trusts	267,990	267,990
Transferred to extraordinary expenditure fund	2,500,000	2,500,000
Surplus	1,251,531	888,417

NEW PUBLICATIONS.

Electrical Railroading as Applied to Steam Railways. By Sydney Aylmer-Small. Chicago: Frederick J. Drake & Co. 924 pages; 4¾ x 6¾ in.; 539 illustrations; semi-flexible cover. Price, $3.50.

According to the preface, the book is intended for those "railroad men who are or may be some day in contact with electrical machinery," and the inference may be readily drawn from what follows that all are expected sooner or later to be in such a position. The chapters, or lessons, as they are called, into which the book is divided, deal with the subject under the form of a simple descriptive introduction usually followed by a catechism on the special topic in hand. The real introduction to the book, the preface, deals in platitudes and the expressions and language have the character of a school-boy's essay, and the method pursued is that adapted to those who are content with a veneer of information rather than those who want to be thorough in what is undertaken, so that its recommendation must be to the superficial. It is a sort of self help, good in its way but dealing with the subject in a manner that, while purporting to convey elementary instruction really requires considerable preliminary information that it may be properly understood. The book proper opens with a series of statements of a mass of facts, that appear to be thrown together at haphazard and with little or no consecutiveness or connection with each other. For the determination of any of these facts the presentation is sufficient, but for retention in the mind it will be found to be exceedingly difficult. Throughout the book, especially in the early part, are to be found these platitudes; as for example, the serious statement that, "it will be seen that a thorough understanding of static electricity is a good thing for a railroad man." The answer to a question regarding the working of a static machine opens with a "No, it doesn't," and in speaking of lines the author says that their number "need not worry us, as the engineer's job is usually to produce lines." These answers are often couched in language that would not explain clearly what is meant either in fact or principle, though there are occasionally matters that are handled in a masterly manner, where the author seems to have struck at the very gist of the subject and in a few words lays down the salient principle. A fine example of this is given in the

explanation of the fundamental principles of the series, shunt and compound wound dynamos. But these cases of conciseness and clearness are unfortunately separated by intervals of obscurity, as, for example, in the explanation of the functions, construction and operation of oil switches.

Towards the end of the work the stock arguments for the use of the electric in preference to the steam locomotive are introduced, and these have been reviewed too often to need a recapitulation here. They are followed by excellent descriptions of the electric locomotives of the New York Central and the New York, New Haven & Hartford, with a final chapter on the air-brake. The printing, paper and binding of the book is good and attractive, but the engravings are blurred as though they were reproductions of previous prints, and not originals. This blurring is especially noticeable in the case of the reproduced wood-cuts and half-tones. In the plates that are published showing the methods of wiring, the fatal oversight has been committed of neglecting to use the established method of putting a half circle in one of two crossing wires to indicate that they are not connected. As it stands, the wire lines form a network that is quite unintelligible to any except those already familiar with the scheme, and these people do not need the diagrams! For those not so familiar, the diagrams are worthless, because of the impossibility of following out the several circuits. The chief trouble with a book of this kind is that it attempts too much within the limits available. This necessarily means that something must be slighted.

The Public's Responsibility for Railway Accidents. By Julius Kruttschnitt, Director, Maintenance and Operation, Harriman Lines. Appleton's Magazine for July.

Mr. Kruttschnitt's discussion of the responsibility for accidents in the July *Appleton's* is well worth reading. He points out that of the great total of 10,618 persons killed on railroads during the last year reported by the Interstate Commerce Commission, more than half were trespassers, and that this waste of life was due to no fault of the railroads, but was chargeable wholly to wilful carelessness, in most cases aggravated by equally wilful breach of the law. Mr. Kruttschnitt further analyzes the list of casualties which remain after the trespassers have been deducted, and shows that in all 88 per cent. of the deaths and 82 per cent. of the injuries were due to other causes than the perils of the road, and that nearly if not quite all of these deaths and injuries might have been prevented by the exercise of ordinary care on the part of the victims. In many cases the accident occurred as a result of heedlessness or culpable disregard of the safety appliances that have been provided by the railroads at a cost of some 125 million dollars.

Mr. Kruttschnitt puts down the heedlessness due to the American temperament as the first great cause of accidents, and, although he sees no way of curing carelessness and folly, he believes that careless people can at least be kept off railroad property where they do not belong. Furthermore, he believes that since penalties are provided for the railroad's failures to provide safeguards, penalties ought also to be set for the public's failure to use them, following the precedent of the English mining law. Mr. Kruttschnitt says that railroad employees naturally reflect the state of public opinion, and that when public opinion regards the rights of corporations lightly or questions whether they have any rights, the attitude of employees will respond. He quotes from the *Atlantic* Mr. Fagan's explanation of the employees' state of mind: "In some way we have got it into our heads that the rules are permissive, not positive. * * * As a matter of fact, we, the employees, are bigger than the rules." Mr. Kruttschnitt suggests that if the public adds to the rules the weight of its opinion, the scale will turn. No one man and no body of men in this country is bigger than public opinion, but the army of railroad employees is now in a demoralized condition and, as results show, is inefficient in safeguarding life and property entrusted to it.

How to Use Slide Rules. By D. Petri Palmedo. New York: Kolesch & Co. 53 pages; 4¼ x 7 in.; 31 illustrations. Flexible cloth. Price, 50 cents.

This little book will be found to be a convenient handbook and guide for those who are about to commence using the slide rule for ordinary simple computations as well as for those who are a little rusty in the matter of the details of its operation. It, of course, does not enter as fully into the minutiae of the manipulation of the device as the larger books that have been written on the subject, and it is so brief in its explanations that close attention must be paid to them, but with this attention there is no reason why the novice should not be able to acquire the information needed to use it successfully. It starts with a description of the Manheim rule and the principle of operation with the logarithmic scale, and then takes up the successive processes of multiplication, division, proportion, continued multiplication and division, squares, square roots, cubes, cube roots, logarithms, powers and roots and trigonometrical functions and the calculations connected therewith. Each is treated concisely and clearly in a way to guide the user of the rule in the work to be done.

Tests of a Liquid Air Plant.—Bulletin No. 21 of the Engineering Experiment Station of the University of Illinois. By C. S. Hudson and C. M. Garland. Sent free on application to the Director, Engineering Experiment Station, Urbana, Ill.

The plant on which these tests were made consists of a four-stage Norwalk air compressor and a Hampson liquefier of the laboratory type. The compressor was driven by a 15-h.p. Westinghouse induction motor. The objects were to determine: (1) the power required to liquefy the air; (2) the cost, and (3) the most favorable conditions for operating. The effect of the temperature and pressure on the efficiency of the liquefier was determined; and, incidentally, some data was obtained on the storing of liquid air in Dewar bulbs of different sizes and under different conditions. An interesting paragraph relates to the efficiency of liquid air as a medium in the production of power. The ratio of the available energy of the liquid air to the work required to produce it was calculated under various conditions, and it was found that under the most favorable conditions not more than 2½ per cent. of the work required to produce the liquid air can be recovered by using the air to drive a motor.

A Government Railroad Holding Company. By William W. Cook, LL.D. In the June, 1908, *North American Review.*

A holding company organized by the government to buy a controlling interest in the stock of all the railroads in the United States, the stock of the holding company to be sold to the public, and the voting rights of the railroad stock to be exercised by the Interstate Commerce Commission, is the suggestion of Mr. Cook. "Surely it were better that a million intelligent and conservative American investors should own and control all the railroads through such a holding company than that the government . . . should own and mismanage this vital element of national prosperity," Mr. Cook says. The point is, however, that American investors would not control the railroads under this plan. It would be left to a commission having no real interest in the economical management of the railroads to control them.

Veteran Association of the Nickel Plate Railroad. J. H. Nichols, Secretary, Cleveland, Ohio.

This association has issued a pamphlet report of the proceedings of its first annual convention, which was held at Cleveland, October 23, 1907. It contains portraits of D. W. Caldwell, S. R. Callaway and a number of the present officers of the company. The membership of the association is made up of men who entered the service of the company on or before October 23, 1882, the day when the road was opened for business.

Manual of Statistics. Published by The Manual of Statistics Company, 20 Vesey Street, New York. 1080 pages; 8 x 6 in. Price, $5.00.

The 1908 issue of this reference work as usual contains information regarding railroad and industrial corporations of the United States and Canada, government securities, mining stocks and grain and cotton statistics. Changes in dividend payments which have occurred down to the date of its issue are also given. The work covers a very wide range, and this is its chief point of value.

The Signal Engineer. Chicago, 160 W. Van Buren St. $1 a year.

This is the name of a new monthly periodical, the June number of which has just appeared, Volume 1, Number 1. The President of the company is M. H. Hovey, and the editor I. B.

Mackenzie. This first number contains portraits of A. G. Shaver, A. H. Rudd, George M. Basford, W. J. Gillingham, Jr., H. C. Williams and H. D. Miles.

Letters to the Editor.

COMPARATIVE EQUIPMENT SUMMARIES.

Chicago, Ill., June 8, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

In the *Railroad Age Gazette*, June 5, you print comparative summaries of freight cars in service in 1900, 1906 and 1907, which you show as made up by the Delaware & Hudson Company. This is written to call your attention to the fact that while the Southern Indiana Railway Company is not included in the statement, it had more freight cars in service in 1907 than four roads as shown in the Western Classification—three roads as shown in the Central Classification and one road as shown under New England roads, although in 1900 it had less equipment than any road shown with the exception of the Western Maryland.

JOHN B. WALSH,
President Southern Indiana Ry.

RESPECTFULLY REFERRED.

SOUTHERN PACIFIC COMPANY.
Los Angeles, Cal., June 6, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

There has been found a nut for the train rule committee to crack, and thinking that your readers may desire to take a "crack" at it I submit it for their perusal:

On a railroad line the stations are A, B, C, D, E, F, as below:

A	B	C	D	E	F
○	○	×	×	×	○

○—Telegraph station.
×—Non-telegraph station.

ORDER NO. 1.—Engine 1 run extra A to F.
ORDER NO. 2.—Engine 2 run extra F to A, meet extra 1 at C.

No. 10 is on time when extra 2 leaves F, and despatcher expects extra 2, after meeting extra 1 at C, to make B for No. 10. After extra 2 leaves F, No. 10 is delayed.

ORDER NO. 3.—Engine 4 run extra F to A and meet extra 1 at D and No. 10 at C.

Extra 2 is delayed at D and unable to move against No. 10, and thereby delays extra 1 at C.

No. 10 arrives at C and cannot proceed farther until extra 4 arrives. Extra 4 is being held at D for extra 1.

No. 10 consults with extra 1 at C and arranges to go to D for extra 4 on the right of extra 1, and extra 1 moves against extra 2 from C to D by placing a flag on No. 10. In this way both No. 10 and extra 1 move toward D under second paragraph of Rule 94.

While the arrangement is being made at C between No. 10 and extra 1, extra 2, having been overtaken by extra 4 at D, is doing the same thing under the rule.

Extra 2 proceeds D to C against No. 10 on extra 4's right to move against No. 10. Extra 4 flags on extra 2 D to C against extra 1.

Under the second paragraph of Rule 94 all these moves are legitimate and the four trains meet on main track between D and C.

An argument may be made that this rule does not apply in this case as a superior train overtook an inferior train at C; but this will not hold good, as it matters not which train arrived first at C, after both have arrived.

If there is any question as to the application of the rule in the case as cited above, we will assume that No. 10 passed extra 1 at a non-telegraph station between B and C—then the superior train is overtaken by extra 1 (an inferior train) at C, and the conditions then existing are within the rule.

The flag movement of extra 1 on No. 10 and of extra 4 on extra 2 is not absolutely necessary to show the possibility of a butting collision under the second paragraph of Rule 94. However, it must be conceded that that is just what the four trains would do, and there would be two trains moving against two opposing trains, under the rule.

WM. NICHOLS.

The heading which we have attached to this letter is not at all exclusive. The subject is referred not alone to committee members but to Mr. Mackie, Mr. Forman, Mr. Dalby or anybody who loves cloister work. For ourselves, we prefer to adopt the course which was taken by Mark Twain in one of his romances, where the heroes and heroines got badly mixed up before the author knew what he had done. He calmly ended the chapter, and told his readers to get the characters out of their fix as best they could! Only, in Twain's case it was a joke. In this case it is not. Having adopted the block system as the only safe method of moving trains, why should we discuss intricate and impossible schemes to get along without it? There are technicalities which can be availed of to bolster up Rule 94; as, for example, the claim that extras are not inferior to one another. Neither has an extra any class. But, as we have often said, it is futile to try to adapt such refined reasoning to such unrefined practice.—EDITOR.

"ARTISTIC" REPORTS OF FREIGHT RATE INCREASES.

Chicago June 8, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

Illustrations of the way the daily newspapers work themselves and their readers into a state of excitement over nothing seem to be growing more and more common. The case which was cited in the *Railroad Gazette* of May 8, where an increase of .03 cents in the freight rate on fresh meat to points in the southern states was presented to the readers of a daily paper as being a sufficient justification for an increase of 2.00 cents in the price of meat to the consumer, was bad enough, in all conscience; but Chicago is not to be outdone by any unsophisticated southerner. The hearing in this city, this week, on the proposition to make an increase in the freight rates on cream [reported in the *Railroad Age Gazette*, June 19, page 196] was seized upon by the daily papers as one of the best finds of the season, and one of them —the *Examiner*—puts it up in this way, starting off with about three inches of head lines and then a dozen lines of full face lower case:

"Chicago consumes nearly 150,000,000 lbs. of butter annually. It now costs $37,500,000, or $102,739 a day, but this outlay will be doubled if the railroads and express companies defeat the shippers. Incidentally, the farmers may quit shipping the product, forcing it into the table luxury class. . . . A butter famine threatens Chicago; not only that, but every consumer may within the next few months be compelled to class bread with butter on it, among the luxuries. This is because twenty transcontinental railroads and express companies are determined to establish a new tariff on cream that will increase its freight rate by from 66⅔ to 125 per cent."

The beauty of this item lies in the simplicity of the mathematics and logic employed: Premise—the freight rate is to be doubled; conclusion—the total cost of the butter will be doubled!

The freight rate on butter averages perhaps one-tenth of its total cost to the consumer. Assuming that proportion, an increase of 100 per cent. in freight would add just 10 per cent. to the cost of the butter; which, in the case of an epicure, might rise to the enormous figure of three cents a week. In the Southern meat case the reporter exaggerated the increase 66 times, but our more experienced "artist" has multiplied the butter increase by 200!

C. H. A.

LOCKED CABINET FOR TRAIN ORDERS.

Baltimore, Md., June 8, 1908.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

In the *Railroad Gazette* of May 22 is a description of a locked cabinet for train orders. With this device in use it is necessary for the operator to deliver all orders, and put train order clip boards in the cabinet before either signal can be cleared. This is as it should be, but how does it work out in actual practice?

On a great many single-track roads (I do not know that this applies to the Southern Pacific as I have never been over the line) the nearest switch of the passing siding is one-eighth or one-quarter mile away from the station. We will

assume that the siding is east of the station, an eastbound passenger train is to meet a westbound passenger train at this siding, and the despatcher wishes to deliver orders to both trains. The eastbound train pulls up to station, receives orders and proceeds to the passing track; in the meantime the westbound train has come up, the trains pass and westbound train pulls up to the station. There is a station down in Maine where this same thing is done every day and very frequently the westbound train is leaving the station four minutes after the eastbound train has departed.

This does not leave the despatcher much time to send his order to westbound train and have it completed, as he cannot send it until after the passage of the eastbound train; if he does, operator must put the train order clip-board in the cabinet before he can allow the eastbound train to pass. If he does this the object of the cabinet is defeated, *i.e.*, all orders must remain on table until delivered.

This device can be improved to enable the despatcher to send orders for both trains before their arrival by using the top half of cabinet for eastbound train order clip-boards, and the bottom half for westbound train order boards. One set of boards should be wider than the other so that the operator can readily tell one from the other; the terminals on the back edge or top of clip-boards should be so arranged that a westbound clip-board if placed on an eastbound shelf, or vice versa, would not close the circuit. This would mean, of course, that two circuits would be required, one for eastbound, and the other for westbound. This would enable the operator to clear signal for an eastbound train and still hold out clip-boards for a westbound train.

With this slight change I see no reason why this device should not be the means of preventing many serious and costly accidents.

W. E. BALLARD,
Chief Cable Foreman, Ches. & Potomac Telep. Co.

ACCOUNTING BORROWED EQUIPMENT.

New York, June 8, 1908.

To the Editor of the Railroad Age Gazette:

In the supplementary report on the standing committee on corporate, fiscal and general accounts to the twentieth annual meeting of the Association of American Railway Accounting Officers, identified as Bulletin 32, there appears under the seventeenth subject a recommendation in the form of the following resolution:

"Resolved, It is the sense of this committee that the accounts, 'Equipment borrowed—Dr.' and 'Equipment loaned—Cr.,' should be eliminated from the classification of operating expenses and included in income account under 'hire of equipment—balance,' on the ground that their inclusion in operating expenses involves a degree of refinement in accounting not warranting the expense."

This recommendation appeals to me very strongly, not on account of the "degree of refinement," but because of the fact that compliance with the requirements of the Interstate Commerce Commission involves a violation of accounting principle. Perhaps consideration of the following propositions is the shortest road to a full understanding thereof:

(1) That depreciation of another carrier's equipment is not an operating expense of the using carrier, since the amount paid for such use is in the nature of rent and therefore chargeable to the income account as a capital expense.

(2) That depreciation accruing on owner's equipment while in the service of another carrier is not an operating expense of the owner, but should be reserved out of the income received for such foreign service.

If these be accepted as fundamental truths, it follows obviously that the only operating expense arising from the depreciation of equipment is that which accrues on owners' equipment in owners' service. It does not follow, however, that the credits to depreciation reserve should be limited to the depreciation properly chargeable to operating expenses. On the contrary, I would urge that the depreciation which accrues on equipment during its service on other roads should be charged against the income from hire of equipment and credited to depreciation reserve. The amounts of such charges could be determined readily through compilation of the service on other roads and the application thereto of the depreciation rate per service unit, established on the basis submitted in my letter of May 23. In this way the credits to the depreciation reserve account would be controlled by the revenue or income producing activity of the equipment and violation of accounting principle would be prevented by confining the depreciation charges against operating expenses to the accrual on owners' equipment in owner's service under a like control.

H. A. DUNN.
Haskins & Sells, Certified Public Accountants.

TAKING CHANCES.

Paterson, N. J., June 1, 1908.

To the Editor of the Railroad Age Gazette:

Why do railroad men "take a chance"; not in connection with signals, and more or less flexible rules, but the voluntarily assumed risk wherein failure is promptly succeeded by permanent disability or death? Not under instructions, because on accepting employment they are plainly advised to disregard any order tending to jeopardize their safety, and certainly not through ignorance, as distressing object lessons are plentiful and varied. This is a hard question; indeed, it is doubtful if one could be found where the answer would be less satisfactory. It may be through bravado, unwise, self-reliance, contempt of danger, or even disregard of its consequences, but at all events a tremendous problem is fast evolving which compels consideration by the management of all railroads.

In the long and appalling annual compilation of deaths and injuries, mention is seldom made of the potent factors, contributory negligence and human proneness to err. To assert that 75, at least, in each 100 cases, result from the victim's own carelessness, or that of a fellow employee, may astonish the reader, in view of the general clamor for additional safety appliances; but this proportion is none the less correct. Some of the state railroad commissions make careful inquiries into even slight accidents, but comparatively few cases are found where the company, if a suit should ensue, could be found liable through defective appliances.

The dangerous occupations of the railroad are those dealing with the actual operation of the trains and engines, and these, mentioned in the order of their liability to produce fatal injury are yard switchmen, freight brakemen, freight conductors, firemen, hostlers, wipers and miscellaneous shop men.

Members of these classes have opportunities, through witnessing the accidents incidental to every shop and yard, to familiarize themselves with the perils of their calling. A large percentage do sensibly adopt the plan of thoroughly analyzing each case of injury, and then adopt for the future such precautionary measures as will guard against the same becoming their own portion. The majority, however, and particularly the younger element, display a surprising indifference. In fact, within a few hours after a fatal accident they will duplicate the identical performance, which under their own eyes has cost a fellow employee his life. So long as this unfortunate and reckless spirit prevails the grim death bulletin presented every quarter by the Interstate Commerce Commission will remain unchanged, so far as these classes are concerned. And the railroads, while honestly endeavoring to protect their men, through safe appliances and stringent rules, will continue to be censured for the "wholesale slaughter," although in so many cases the trouble is brought about through a situation clearly beyond the employer's control.

The three prominent factors of safety, now recognized as indispensable in railroading, are the continuous automatic train brake, the automatic coupler and some form of block system. Fifteen years ago it was a common remark among railroad men that the universal use of these appliances would practically safeguard their calling, or at least reduce accidents and personal injuries to a minimum; but that was a short sighted view, leaving out of account a large class of accidents. In regard to air-brakes and automatic couplers it became in time unlawful to operate without them, and the prompt compliance by the railroads is shown by the reports of the Interstate Commerce Commission.* By the end of

*On June 30, 1905, the number of locomotives and cars in the United States aggregated 1,891,228, of which 1,641,395 were fitted with continuous train brakes, an increase of 86,623 over the year 1904; and 1,871,590 were fitted with automatic couplers, or an increase of 48,560 over the previous year. All of the locomotives and cars in passenger service had train brakes, and all but 82 locomotives in the same service were fitted with automatic couplers. Practically all cars in passengers service had automatic couplers. All of the 27,869 freight locomotives were equipped with automatic brakes and couplers. Of the 1,731,409 cars in the freight service, the number fitted with train brakes was 1,515,354, and with automatic couplers 1,715,854.

1905 the safety appliance law prevailed generally, with all locomotives and cars in active service fully equipped. But look at the personal injury report of the same commission, covering nine months of the following year, 1906, at which time there was a general compliance with all requirements of the new law.

During a single quarter, April, May and June, accidents to employees from all sources aggregated 933 killed and 16,004 injured. The total number of employees killed up to and including September 30, that year, from all sources, was 3,807. The latter is more than in the entire 12 months of 1905. The general introduction of these safety appliances, therefore, while protecting the traveling public, has not been effectual in safeguarding the employees. The majority of the injuries occurred outside of the protection afforded by the air-brake, and were largely due to the alarming and growing disregard of personal safety manifested by the rank and file.

Criticisms of railroad managers for alleged disregard of employees' safety are unfair, in that they credit all of the injuries shown on the interstate bulletin to accidents on the road; such as collisions, trains breaking apart and derailments. The fact seems to be generally unappreciated that the list mentioned represents every person injured in railroad service, irrespective of his position on the railroad. If properly presented the figures would show only about 20 per cent. due to train wrecks. In the report for the second quarter of 1906, the injuries through accidents on the road were 3,031, while from causes other than collisions and derailment the number was 12,973 in the same period. These latter were the victims, largely through their own imprudence, of the yards, roundhouses and shops. The total number of employees killed on the road in a year is insignificant when compared with the number fatally injured through switching movements in a month.

Contributory negligence may be observed every day where a freight brakeman runs alongside of moving cars, often in the dark, meanwhile pulling open the coupler knuckle by hand and neglecting the lever designed for the purpose, placed conveniently on the end sill of the car; where he "clubs" or uses a stick of wood for increased leverage in the brake wheel of a car, which he may be riding into the yard, with the resultant breakage of the "club" and fatal fall of the brakeman; where he dozes while lying extended on the top of a car in a freight train moving through the yard, and the jolting brings him nearer to the edge and to eternity; where, when flagging a following train, he falls asleep while seated on the rail, and where he neglects to step away from a push pole (used in moving cars) after placing the pole in position. These five causes alone contribute some 30 per cent. of the cases to the annual injury list.

Enginemen, while in the vicinity of terminals, and even on the road, ride with their head and shoulders out of the cab window. Instances are plentiful where this has resulted in instant death, through contact with mail cranes, overhead bridge supports, and (occasionally) signal posts, the posts having been undermined in rainy weather and made to lean toward the cab. Firemen, when opportunity permits, climb the tenders to shovel coal ahead for future needs, and on the high tenders now in use incur the liability of being knocked off by an overhead bridge or tunnel. After taking water at a tank they return the spout to its normal position by giving it a push with a shovel or fire hook; in which operation to miss the spout means a fall likely to result in death. Firemen and ash pit men, while cleaning the fire on a locomotive, have been noticed to place one foot on the rail against the driving wheel, to obtain greater purchase in "hauling up" the dump grate, or to pull the ashes from the pan, losing sight of the fact, or ignoring it altogether, that another engine arriving on the pit may strike the one being cleared with sufficient force to move it. Ever so little movement means the loss of a limb, if not fatal injury.

Turntable men are prone to use their feet to kick into position the track latch while the turntable is moving. Only through the exercise of the greatest dexterity is this manoeuver effected without the accompaniment of a crushed foot. Wipers engaged in a pit under an engine invariably emerge through a "short cut," generally implying a tight squeeze between two of the driving wheels, in preference to the reasonably safe exit which the head or rear end of the pit would afford. Machinists and their helpers entangle their limbs and bodies in portions of the air-brake rigging under the engine or tender, without previously taking the precautionary measure to turn the cut out cock, placed for the purpose, which would render that portion of the brake being worked on inoperative, should someone carelessly move the valve in the cab. Shop men run hand trucks across tracks without looking in either direction, and often the tracks are obscured by the inevitable smoke and steam of the roundhouse. Men in all of these occupations, and many more about the railroad, jump on and off moving cars and engines, when no excuse can be found for so doing, and when time is not at all pressing.

No railroad company in the world requires that its employees take such chances; many, in fact, refuse even to countenance the exhibitions, and punish the offender by immediate dismissal. Of 540 carefully tabulated cases of injury to shop men in the shops of a large eastern railroad, 487 resulted from a disregard of what common sense would construe as only ordinary precaution on the part of the victim, while the remainder were the innocent victims of like carelessness on the part of others.

Railroad employees actually on the road are, indeed, safer than those employed in yards and shops because similar opportunities do not present themselves for reckless disregard of safety. The baggage master, conductor and brakeman of passenger trains are exposed to no particular peril while in the cars, and the engineman and fireman can take care of themselves by the exercise of reasonable care. If the road is equipped with the absolute block system, and the high-speed brake, there need be little liability to injury from one year's end to the other. Curiously it is before the start is made that the engineman's suicidal tendency is most often manifested. A runner has been seen doing some work beneath the engine, and, when the signal was given, to call on the fireman to start up, meanwhile scrambling out after the wheels had started to revolve. The slightest entanglement of his overalls with any part of the engine would have delayed his escape until he had been effectually disposed of. In another instance a fireman was observed to run alongside of the engine after it started, and to kick at a sand pipe to throw it straight with the wheel. The consequences of a miscalculation in the kick may be easily imagined.

Railroad officers freely admit that they have a serious problem on their hands in trying to make their unskilled laborers, who appear to be the worst offenders, hold their lives at a proper valuation. We have the anomaly sometimes that everyone in the rank and file of a road may be classed as a good man, with a faultless record, so far as the observance of operating rules is concerned, while yet the majority are sad delinquents in the unwritten rules regarding personal safety.

ROBERT H. ROGERS,
Erie Railroad Inspector.

CAST IRON CAR WHEELS.

New York, June 23, 1903.

TO THE EDITOR OF THE RAILROAD AGE GAZETTE:

The importance of the communication from J. E. Muhlfeld, General Superintendent Motive Power, of the Baltimore & Ohio, on cast iron wheels, published in your issue of June 12, leads me to go into more detail on the matter than it was possible to in my letter published in your last issue.

The wide range of Mr. Muhlfeld's communication—the positive way in which many of his conclusions are set forth and his presentation of many details pertaining to the practical manufacture of chilled wheels—all constitute a basis from which opinions might be formed and impressions created in the minds of other railroad officers that might seriously affect their course of action in the important stage which this subject has so recently reached. It is very important to arrive at actual facts in the matter, so far as possible, and to avoid impressions that Mr. Muhlfeld may hold becoming fixed in a general way in the minds of those interested, because he has stated them as though they were generally accepted as the result of present and past practice in the manufacture and use of chilled car wheels.

I believe that Mr. Muhlfeld's communication is one of the most important that has yet been made upon the subject, and

also that a comparison of studies and experiences will enable better knowledge and action upon what is to-day the most important problem before the railroad and traveling public.

If, therefore, direct issue be taken to some of the conclusions stated by Mr. Muhlfeld, it is only because as the result of an intimate practical connection with the manufacture and use of chilled wheels extending back about 35 years. I have not reached the same conclusions in many important respects as those presented by Mr. Muhlfeld.

In general it may be said that there is no item of railroad equipment having the importance in respect to qualities that should be possessed, to compare with the car wheel. Every other item of railroad construction is, so to speak, fixed—but the car wheel, with its attendant axle, is the prime moving factor—the one thing connecting the load carried with the support provided for carriage.

It would be naturally concluded that to this one thing great attention would have been devoted. It would seem that as years went on, as loads carried and speed attained were increased, that the car wheel would have been perfected for its work as much as possible. It would seem that the danger of life and loss of property, caused by the failure of car wheels, would have led to a good, if not the best, order of practice in the manufacture and use of car wheels.

But the actual developments have been quite the reverse.

Practically all wheels used under freight cars in America are chilled cast iron wheels—comprising over 95 per cent. of all wheels in service. About 5 per cent. of the total number of wheels in use are of the steel or steel-tired type, used under passenger cars, locomotives, etc. Wheels of the latter class receive much attention; high prices are paid for them. Expensive repairs and renewals, turning down of tire, etc., are attended to when necessary; but side by side with this small percentage of high-grade wheels run millions of another grade bought at a fraction of the cost of steel wheels, put in use with no mechanical preparation whatever except having hub bored to receive axle—never repaired—used until worn out, then replaced by new ones, put into service at a first net cost of less than $4 per wheel (scrap value deducted), guaranteed by the maker against any defects due to manufacture for four or six years' service. This is the point of development attained on 95 per cent. of all the car wheels used in America.

So much is said about the increasing failures of chilled wheels—and so much concern is displayed over their shortcomings—that it would be natural to conclude that every means for keeping up and improving the quality of the wheel had been made use of. The actual fact is that, too often no means for depreciating it has been neglected. If many of the chilled wheels of to-day are unsafe and unfit for present service condition, there is but one reason for that fact. The price paid for such wheels for years past has made it impossible to produce the right quality. It has been a long struggle between the buyer of cheap wheels and the maker, with the odds all against the latter. The buyer of such wheels, making specifications more rigid and severe from year to year, and at the same time placing orders with the lowest bidder, the maker taking orders at a price that compelled the use of the cheapest material and the crudest practice.

Now, it is frequently said that the chilled wheel has reached the limits of safety under heavy equipment and some substitute must be found. There is no doubt of the fact in the case of chilled wheels made as Mr. Muhlfeld describes it, "of cheap coke iron, malleable and miscellaneous cast scrap—crop ends of steel rail to reduce carbon—too great a percentage of all miscellaneous high sulphur wheels—the addition of a large percentage of ferro-manganese to give strength—practically no charcoal iron—the use of high sulphur coke for melting."

There are not so many wheelmakers carrying out practice of this dangerous order, but no matter how few there may be it is about time to stop the practice.

It is not a question that concerns any one railroad or any individual wheelmaker. Over 50 per cent. of all wheels applied in renewals to the cars of any one railroad are bought and applied by whatever railroad the car happens to be running on when wheels must be replaced. Any one railroad may buy wheels at proper prices from responsible makers, but that has little or nothing to do with accidents from failure of wheels on that particular railroad, because the greater part of the wheels in use on the line were bought and put in service by other railroads. Any one wheel maker may buy good material, so far as he is able to pay for it out of fair prices he may receive, but he gets wheel for wheel in part payment, one scrap wheel for each new one sold to a railroad company—he cannot discriminate as to the quality or make of scrap wheels delivered, compelled as he is to use large proportions of such miscellaneous scrap wheel—thus the inferior material is spread everywhere.

These matters have been known for years. Wheelmakers have protested—individual railroad officials have admitted them, though not publicly. Wheelmakers have been told on the one hand by mechanical officers that they should not quote prices or accept orders except on a basis that permitted the delivery of good and safe wheels, and by purchasing agents, that price was the only thing that would be considered. Many leading railroads have made their own prices for years past, and wheelmakers on their lines, unwilling to meet such prices, have received no orders.

It must be said in justice to the purchaser that there always were, and are now, some wheel makers that quote any price, accept any guarantee or test conditions offered, and give positive assurance that the wheels supplied would be of the best quality. In such cases the purchaser generally holds that the responsibility is on the maker, because guarantees are given, and on the mechanical department, because inspectors must pass upon the quality of wheels accepted. And the maker holds that the responsibility is on the buyer because the latter cannot expect to receive quality that he is unwilling to pay for. And so the whole operation passes on to a miserable order of conditions for which all concerned are undoubtedly more or less responsible for results, but for which after all the railroads must provide the remedy by paying the price that will at least enable the use of good material and proper practice. As Mr. Muhlfeld says, "This condition has been brought about by the failure of the purchaser to specify the mixture or analysis, or both, by the purchase of wheels being too much of a commercial transaction on the basis of cheapness or some fixed scale of prices with the guarantee as a protection, and on account of the practice in vogue having resulted in the new wheels being largely a result of former wheels lacking the essential added proportion of new live material." These are candid admissions, and they are made at the psychological moment. They will surely lead to the establishment of responsibility for the continuation of present conditions and to the inauguration of new ones.

The railroads and the wheel makers will be under great obligations to Mr. Muhlfeld if such a result ensues. There will be railroad officials and wheel makers who think the better plan will be to put off vigorous action on the ground that conditions are exaggerated, but their opinions may be founded on a lack of practical knowledge of the dangers of the situation.

It may be observed that the ultimate test of any item or design of any item of railroad equipment on American railroads lies in the fact that it remains in service over any considerable period of years. Changes may be required in the particular type of any item, because service conditions change, but when one type persists as the present standard double plate chilled wheel has done for fifty years it is reasonable to conclude that it has stood the great test of long service.

Mr. Muhlfeld has described the evolution of chilled wheel types from the early days of tram and steam roads, giving sectional illustrations of the 33-in. ribbed single plate wheel used on the Baltimore & Ohio in 1870 weighing 475 lbs. and also of the special section of Baltimore & Ohio 750-lb. wheel used in 1903, and present 700-lb. 33-in. M. C. B. standard wheel. Also of the double Bush and Lobdell convex plate wheel. The single plate wheel, 33 in. diameter, weighing about 475 lbs., succeeded the cast-iron spoke wheel about the years 1850 to 1860. As the loads carried and speed of trains increased, trouble was experienced with the cracking of the straight single plate wheel due to expansion of tread from brake heating and the double plate wheel was designed to admit of this expansion without breakage. This idea was successful because the curved lines of the double and single plates permitted the expansion without fracture. The section of Washburn double plate wheel designed and introduced between 1860 and 1870 weighed about 500 lbs. and it is interesting to note that the lines and curves, the location of plates with reference to tread, are to-day practically the same as they were 40 years ago. At first the

double curved bracket was used, but during the past 20 years the single curved bracket has come into general use.

The thickness of plates and tread has been increased from time to time as loads and speeds increased, until now the standard 33-in. wheels weigh 700 lbs. and are even made to weigh 750 lbs.

Mr. Muhlfeld states, "The full double convex plate wheel has many advantages over the present generally adopted design. It can be cast flange up and the metal as poured through the hub spreads out evenly over the bottom plate and arises uniformly and regularly in the tread and flange, which is filled before the pouring of the upper plate and hub is completed. Through the shape of this pattern it was practically unnecessary to put the wheels through the annealing process as practised to-day, whereas, with the Washburn Atwood design, the wheel must be molded and cast flange down and the same number of streams of iron as there are numbers of brackets flow from the hub and strike the chillers either radially or angularly, after which the metal must divert in either one or both directions circumferentially, which necessarily produces internal strains that must be relieved by some adequate annealing process."

These statements and conclusions are very different from those that the writer would give as the result of observation and practice, which are—

The present type and section of double plate has remained in use during many years because it conforms best to the requirements of foundry practice in manufacture and to the requirements of service. The full double convex plate wheel of the design given by Mr. Muhlfeld is practically based on doubling the single plate wheel. A comparison of the types as illustrated by him will make this apparent.

By making the curve of the old B. & O. upper single plate concave, instead of convex, the lines are almost identical. The addition of the lower single plate in the type of double convex plate wheel illustrated simply adds a lower single plate on the same principle.

It is difficult to see, therefore, why the reasons that caused the elimination of the single plate wheel would not also apply to what is (to use a paradox) a double single plate wheel, and it is difficult to see how the rapid expansion of tread, single plate, and single curved brackets now imposed on the present standard wheel would be provided for at all in the double convex plate wheel. Also, in view of the fact that cracks in tread and flange, arising from brake heating and other service conditions, are such an important factor in present service, it would seem apparent that the support afforded to tread and flange by the brackets in present section should not be dispensed with safely. To cast any chilled wheel flange up would, in my opinion, be very undesirable. The upper part of any casting is liable to be the most porous and defective, and as general practice anywhere has followed the plan of casting wheels with flange down, it is reasonable to conclude that there must be a good foundation for it. Not to go into details of why one type of wheel might be better than another, the following reasons may be given as to why the present standard plate design enables good foundry practice when the operation is properly carried out. The molten iron first entering the mold quickly forms a considerable mass in the basin created by the shape of inner hub and bottom double plate, and as the mold fills up it is important for the rapid pouring of the metal that a cushion of fluid metal, so to speak, is provided for the entering metal to strike. As the mold fills up a continuous circular body of fluid metal forms in the lower double plate and continues to form in this shape, with any variation in pressure relieved by the fact that the metal can rise quickly in the lower single plate. At the same time, each curved arm or bracket, of which there are fourteen or fifteen, constitute runners or gates, leading to the flange and tread. The body of metal in the central portion of the mold is conveyed through these brackets or runners to the flange and tread under the important condition that any slight scum, impurities or foreign substance is kept in the central part of the mold and not conveyed to the vitally important section of flange and central part of tread. The motion of the molten metal rapidly running through these circular curved brackets or runners, is given a circular direction in the flange and tread, insuring greater solidity and homogeneousness.

In the same manner the dip of the upper plates at junction of double and single plates compels the fluid metal to again pass to the upper part of tread without any opportunity of carrying any slight scum to the latter, because there are no flat open places in the mold that permit such a thing. It must also be remembered that the whole operation of casting a wheel mold does not take over 12 or 15 seconds of time in good practice.

These conclusions are stated with due regard to the fact that Mr. Muhlfeld may have had other results which have caused him to form the opinions expressed—but it must always be remembered that general methods of foundry practice long continued in matters of this kind indicate that there are good reasons for the same.

Mr. Muhlfeld states that with the double convex plate wheel pitting would be unnecessary. Of course, some process might be followed to take the place of pitting which would be quite possible, but that pitting would be eliminated by the manufacture of the double convex plate wheel, when it would have to be practiced with the present double plate standard wheel, is not likely. Considerable attention should be given to these details of wheel section, because it is vitally important that no steps be taken to try to find the remedy for present conditions in directions that have been well tried out before, without indicating that the relief sought will be obtained.

Upon the important point of service conditions, Mr. Muhlfeld dwells upon the relations that prevail in the contact of wheel and rail when both sections are new and have not sustained wear. It is true that in any case, whether in original line and section or in the same particulars after average service, that the contact between wheel and rail is very small. He gives it, in the case of new wheels, as being less than the equivalent area of a ½ in. diam. circle, and states that this contact "is sufficient to prevent such concentration of load as would produce disintegration of a good quality of chill."

It does not occur on a circular spot, of course, but on the contact line of wheel and rail across the latter. The actual contact depends principally upon the condition of wheel tread as to wear, although rail wear or alinement is also a factor.

But it may be assumed that a contact of, say, ⅛ in. wide, across the rail, would be the maximum, and this contact in service is never maintained upon one point, but on a constantly changing point as wheels revolve.

In Mr. Muhlfeld's illustration he gives the contact between a new wheel coned 1 in 20, and a new rail, showing how the load concentrated on tread next to flange. This is correct if rail is level or horizontal on top, and provided it does not give or deflect toward the inner side under the load. Considering the thinness of the supporting web of rail, compared with the thickness of rail-head, it would seem reasonable to suppose that some deflection or movement does take place, and in such a case the contact would be more uniform across rail head.

In any case, the coning of 1 in 20 would disappear so quickly under wear from brake shoes and rail friction that it does not seem as though the constant service factors that determine practice and results could be properly based solely upon conditions of contact when rails and wheels are new, and on the presumption that the support of rails on ties is so fixed that rail heads will not deflect from a theoretical position.

Much attention is paid to the question of increasing or decreasing the cone on treads, but after a few months' service this cannot be such a vital factor because the difference in cone becomes less and less of an actual fact.

On the all-important point of cause and development of seams in tread and flange, Mr. Muhlfeld at times refers to them as being caused by brake heating; at other times are due to quality of material used. My observation has caused me to hold the following opinions on this matter:

The use of coke iron and scrap and the presence of excessive percentage of sulphur and ferro-manganese will produce wheels which will develop cracks and seams more quickly under brake-heating than the use of better material, but to assume that any quality of metal can produce a wheel that can be constantly heated and cooled on tread and flange without surface cracking is not borne out by any practice in metallurgy or by any experiment or test that can be readily applied to chilled car wheels.

The thermal test so generally used demonstrated this fact. If wheels on which such a test is applied are allowed to stand over night, so that some rust can penetrate the cracks, the latter will be seen quite the same as on wheels removed from service that have been subjected to continuous brake-heating and cooling in snow or water.

It does not seem necessary to discuss this point in detail when the actual proof is so easily obtained.

As to the character or quality of metal that will give longest resistance to the development of such cracks to a dangerous point, it may be said:

The use of ferro-manganese and inferior scrap mixtures will quickly cause such results, because the manganese induces greater cleavage between the crystals of chilled iron and permits them to become separated from each other more readily. This property of ferro-manganese may be readily observed in the metal itself.

The chilled crystals from such mixtures are also larger and more coarse than the crystals formed in mixtures of neutral strong charcoal iron. This may be readily observed by examination of sections taken from the tread of car wheels made many years ago before the use of mixtures of coke iron and scrap came into vogue. Wheels made ten or fifteen years ago from good qualities of charcoal iron are still to be found among the wheels removed from old equipment, or sample chill pieces can be readily made now from mixtures of good charcoal iron in which strength and chilling qualities are not obtained by the free addition of ore containing considerable percentages of manganese. Manganese introduced into the blast furnace in the shape of ores containing it is not as detrimental as when introduced in the wheel foundry as ferro-manganese, because in the former case it becomes more thoroughly combined with the iron through two processes of melting—one in the blast furnace, one in the foundry cupola. But in the foundry ferro-manganese is largely introduced into the large receiving or small pouring ladles, and does not become combined with the iron uniformly. Especially toward the end of each day's heat, when the molten iron may not run so hot from cupola or at any time during the heat when the iron does not run hot on account of some one of the causes that affect cupola practice.

In charcoal chilling iron of the best class the crystals that form on the chilled surface are fine and needle-like in appearance and are interwoven and attached to each other so as to give far greater adhesion and strength than can be obtained in mixtures of an inferior class.

In the field of the crystalline structure of chilled iron there are possibilities of practice of the highest order that have been worked out, but have never been put to use. In this, as in all other possibilities for improving the chilled wheel, progress has been at a standstill for years because the price at which wheels could be sold did not permit of progressive work.

I do not agree with Mr. Muhlfeld that it is necessary or advisable to change present wheel sections or location of plates, tread, etc. To try new designs is commendable and necessary, but there is a great necessity of applying remedies that are perfectly apparent as to their pressing need and of then taking up those that promise relief in new directions. The writer believes in this connection that the application of brake shoes must be removed from the bearing tread and flange, and has proposed for that purpose the addition of a separate but integral braking ring to the present standard wheel section. This would necessitate charges in present brake-beams, etc., on present equipment, but would seem to provide a remedy.

If the railroads will pay the small advance necessary to permit the use of good material and good practice and take the necessary steps to make sure that they get what they pay for, then the all-important step will be taken and others can follow. It will not involve any considerable increase in cost. If mixtures of the class Mr. Muhlfeld proposes were used, namely, 40 per cent. of new charcoal iron, it would not add to exceed 80c. to $1 to the cost of a wheel.

The 40 per cent. of new charcoal iron would replace a like amount of present mixtures. Taking a low cost basis, say that 40 per cent. new charcoal iron was substituted for a like amount of old wheels. The difference in cost between the two should not exceed an average of $6 or $8 per ton, according to location of maker's works. Forty per cent. of this difference would add $2.40 to $3.20 to the cost per ton of mixture, which would be sufficient to make three 700-lb. wheels for heaviest service, or 80c. to $1.07 per wheel.

A charge of $1.50 to $1.75 extra per wheel should amply cover the extra cost of providing better material and practice. This would be an added first cost of 20c. to 26c. per annum on four-year guarantee. Almost any railroad officer would express a willingness to pay the slight extra price if it would relieve the dangers of the present situation. The grave question is, Will they do it, or will the present agitation of the subject soon drop back into the bargaining of purchasing agents to gain a few cents reduction in the price paid for wheels, and into the offers of some wheel makers, anxious for orders, to cut prices?

The percentage of serious accidents caused by such conditions may or may not have reached the point where the necessary changes in practice will be instituted and rapidly carried out. Railroad officers may be too busy individually and collectively to give the matter the important attention it deserves. In that case the present discussion will soon drop, but when a leading practical officer of one of the important systems of the country comes out with such a blunt presentation of the dangers and responsibilities of the situation as Mr. Muhlfeld has made, there is indeed hope of proper action without delay.

On the subject of steel wheels, I note that I am quoted at considerable length by Mr. Schoen, in the June 19 number of the *Railroad Age Gazette*, as admitting that the chilled wheel is no longer safe for service.

Mr. Schoen's conclusions are based on my criticisms of inferior chilled wheels, which I quite agree with Mr. Schoen are unfit and dangerous for service, but this does not afford the slightest ground for argument or assertion that because some railroads have bought and some wheel makers have sold inferior wheels, therefore all chilled wheels are inferior and unsafe.

Mr. Schoen has made a detailed study of the results obtained from wheels made at his works and those obtained from wheels made by others, and therefore must believe that some steel wheels are better than others. He would not likely be willing to assume the blame for poor steel wheels made by other steel makers.

As to the figures of comparative cost of his steel wheels and chilled wheels, given by Mr. Schoen in the *Railroad Age Gazette*, he is certainly generous in his calculations of the possible mileage of steel wheels, and rather the opposite with the mileage allowed for chilled wheels. Of course, all calculations are, in a way, interesting, but the basis on which they are made is the real thing, after all.

Upon the estimated cost of replacement of solid steel or steel-tired wheels, Mr. Schoen's figures are considerably below the charges made by one railroad against another for replacement of steel wheels which are, according to M. C. B. rules for 1907:

33-in. steel or steel-tired wheel—charge for new wheel	$23.00
Allowance for scrap wheel	5.00
Net charge	$18.00
Additional charge of $1.75 per pair for fitting.	
Additional charge for removing and replacing	5.00
Total net cost	$23.00

Additional charge for loss of metal on returning of tires, $1.50 for each $\frac{1}{16}$-in. of metal removed.

In the case of a steel wheel worn to M. C. B. limits of sharp flange it is probable that ¼ each at least would have to be turned off tread to restore standard depth of flange; this would add considerably to above cost.

I wish to add in conclusion that it has seemed advisable to make these replies at considerable length, but the views presented are entirely the result of personal experience and observation, and are not set forth as representing those of other wheel makers.

P. H. GRIFFIN.

ELASTIC INSERTION-PLATES IN PERMANENT WAY.

In Germany experiments with plates of elastic material inserted between the rails and the supporting surfaces have been carried on for a number of years. The function of these plates is to lessen the noise of the trains, especially on bridges, to reduce the wear on wooden bridge-stringers and wooden ties, to minimize jars and decrease the wear of rolling stock.

Plates of hydraulic compressed felt, 0.75 in. thick, used between tie-plates and the wooden stringers of bridges, have been in service six years. Soon after placing a considerable compression was noted, making them harder and less elastic, thus rendering them less efficient. This compression was not uniform and caused a narrowing of the gage. This lack of uniformity of compression was in part due to the style of tie-plate.

Plates of chrome leather, 0.2 in. to 0.3 in. thick, have been in use since 1901 in connection with bridge stringers and switch ties. In both cases they have fully met the requirements, lessening both the force of the blows and the noise. After six years' service they are reported as having suffered no diminution of elasticity, and they seem peculiarly fitted for the service. Used on switch ties, they have been repeatedly taken out and put back during repairs, and none of them had to be scrapped as unfit for use.

Plates of woven fabric and felt, 0.4 in. thick, were built up of layers of felt and of woven fabric sewed together, consolidated by hydraulic pressure, treated and in some cases painted. They were used on bridges, switches and on ashpits. Soon after being put in service considerable compression was noted. In July, 1903, they were used on switches. The maintenance of the gage of switches necessitates frequent removal and interchange of the insertion plates, and it was found that under these conditions the sewing parted, the layers became separated more or less, and many of the plates had to be scrapped, so that in August, 1905, they were replaced by chrome leather plates. In 1904, plates of this kind were used in connection with ashpit tracks, and after three years' service they show no marked deterioration.

The cost of the different insertions per square foot is: Felt, $1.08; chrome leather, $0.90; woven fabric and felt, $0.48.

POOR'S MANUAL FOR 1908.

Poor's Manual for 1908 (forty-first annual number) is issued. Although the work appears some two months earlier than last year and five months earlier than in 1906, yet it is as complete as ever, covering the 1907 fiscal and calendar years, and containing information concerning the more important companies up to June 10, 1908.

An important feature of this edition is an enlarged industrial section embracing every prominent corporation in the United States from which a report could be obtained. Information is strictly up to date, and in the case of the larger companies include elaborate tables showing income accounts and balance sheets in comparative form for a series of years. In general treatment the industrial section compares favorably with the railroad section.

The total mileage of the steam railroads of the United States on December 31, 1907, was 228,128 miles, as against 222,766 miles on December 31, 1906, showing an increase of 5,362 miles.

The total capital liabilities of the railroads, including stock, bonds and other indebtedness, was $16,501,413,069, showing an increase of $907,864,112. Of this increase $351,717,809 is represented by stock and the balance by bonds and other forms of indebtedness.

The following table shows assets and liabilities of all the steam railroads of the United States at the close of 1907:

	1907.	1906.
Capital stock	$7,458,126,785	$7,106,408,976
Bonded debt	8,228,245,257	7,851,107,778
Other bond obligations	815,041,027	636,032,203
Accrued liabilities	94,938,347	86,218,524
Miscellaneous liabilities	75,450,828	124,319,942
Bills payable and col'c't accounts	857,734,167	722,023,502
Sinking funds, etc.	239,727,545	242,256,471
Profit and loss	789,617,481	686,919,232
Total liabilities.	$18,558,881,437	$17,455,286,628
Cost of railroad and equipment	$13,364,275,191	$12,719,736,342
Stocks and bonds owned	2,884,031,173	2,544,368,852
Real estate and other investments	738,843,199	761,413,476
Cash, bills rec. and Col'c't acc'ts	979,730,908	941,399,320
Materials and Supplies	224,237,534	182,635,253
Other assets	208,171,082	128,591,860
Sinking Funds	159,592,350	177,141,525
Total assets	$18,558,881,437	$17,455,286,628

Gross earnings of the railroads reporting earnings for 1907, embracing 225,227 miles, amounted to $2,602,757,503, as compared with $2,346,640,286 in 1906, showing an increase of $256,117,217, or nearly 11 per cent. Net earnings from operation in 1907 were $833,839,600, as against $790,187,712 in 1906, showing an increase of $43,651,888, or about 5½ per cent. In 1906 net earnings had shown an increase of more than 15 per cent.

The following table shows the income account of the American railway system for the year 1907, as compared with 1906:

	1907.	1906.
Miles of railroad operated	225,227	220,633
Passenger	$574,718,578	$521,231,337
Freight	1,825,061,858	1,659,925,643
Other	202,977,067	165,483,306
Total gross earnings	$2,602,757,503	$2,346,640,286
Operating expenses	1,769,417,903	1,556,452,574
Net earnings	$833,339,600	$790,187,712
Other receipts	128,015,081	100,292,369
Total net income	$961,354,681	$890,480,081
Taxes	74,253,245	68,169,833
Interest on bonds	280,931,001	269,926,395
Other interest	23,759,329	13,107,169
Dividends on stock	247,258,219	225,601,245
Miscellaneous	75,176,725	79,806,024
Rentals—Interest	38,188,406	39,612,179
Dividends	31,087,374	27,739,680
Miscellaneous	18,127,456	15,042,783
Total payments	$788,781,755	$739,005,308
Surplus	172,572,926	151,474,773
Traffic Statistics.		
Miles of railroad operated	225,227	220,633
Revenue, train mileage:		
Passenger	$511,579,317	$488,554,209
Freight	645,447,465	608,324,539
Mixed	27,211,527	27,711,651
Total	$1,184,238,309	$1,124,590,399
Passengers carried	885,724,314	815,774,118
Passenger mileage	28,370,247,819	25,842,462,029
Revenue per passenger-mile, cents	2.040	2.011
Tons freight moved	1,722,210,281	1,610,099,529
Freight mileage	233,137,507,807	216,653,795,696
Revenue per ton-mile, cents	0.782	0.766

AMERICAN RAILWAY ASSOCIATION.

In the *Proceedings* of this association, just issued, we have the doings both of the regular meeting held in New York, April 22, and of the special meeting which was held in Chicago, February 7, to consider the rate for interchanged freight cars.

The revision of the articles of organization, which was adopted at the April meeting, provides that roads operating less than 100 miles (instead of 50, as formerly), and those operated solely by electricity, may be admitted to the association only as associates, not as members. Under a new section of the by-laws (Section 10) the chairmen of the several committees are to constitute a council which may be called upon by the president of the executive committee for consultation concerning the affairs of the association.

The executive committee proposed a number of amendments to the articles of association, which will be acted upon at the November meeting. These proposals, prepared by a subcommittee consisting of Messrs. L. F. Loree, G. L. Potter and Daniel Willard, provide for a radical rearrangement of the committees of the association. Aside from the executive committee and the nominating committee, the standing committees proposed are one on transportation (9 members); one on maintenance (9); relations between railroads (15); electric working (9); traffic relations (15); accounting and statistical inquiry (9); legal and economic relations (15). The kinds of work which would fall into the hands of these several committes are perhaps sufficiently indicated by the titles, though it is proposed that the one last named shall deal with a number of subjects which have not hitherto been prominent. The sub-committee proposes that this seventh committee should:

(*a*) Supervise the work of the Eastern and Western railroad associations covering the patent laws.

(*b*) Collate the laws of the United States and of the several states on the subject of railroad operation, tariffs, taxation, etc., and employ such special counsel for the study of these questions as may be necessary to assist individual counsel of the railroads in the work.

(*c*) Provide a corps of specialists to appear before railroad commissions and other bodies to give testimony as to railroad practice and the effect thereon of proposed public measures.

(*d*) Endeavor to place before the public in general, in a comprehensive way, elementary knowledge of what the railroads really do and how they do it, and the necessities which cause it being done in the way in which the service is now organized.

(*e*) Create a library bureau in which would be kept complete infor-

mation as to the conditions which gave rise to the various transportation and traffic associations, the functions performed by them, the sources from which they derive their authority and the limits of that authority, the extent to which and the manner in which they are co-ordinated, and a file of the proceedings of each association, and to be a depository of papers and records in regard to questions affecting the various phases of railroad relations.

The executive committee recommends that article 8 of the Articles of Organization be amended so that the secretary of the association, in connection with the chairman of each committee, shall appoint secretaries for the committees. The secretary of the association is to have a general supervision over the work of the committees, and also is to be custodian of the records, not only of the association, but of the committees. It is proposed that where desirable any one of these committees, with the approval of the executive committee, may choose a chairman who need not be an officer of a member of the association. The sub-committee which proposed these amendments has considered in detail the question of the relations of the American Railway Association to the various voluntary associations of railroad men and its recommendation, endorsed by the executive committee and also by the association, is to the effect that all railroad presidents be asked to take action on this important matter. The presidents are requested to bring it to the attention of those of their officers who are members of the voluntary associations, and to set forth that the desired harmonization and co-operation will increase the usefulness of the organizations by enabling them to "submit to the American Railway Association for approval such of their findings and recommendations as require authoritative action, before the same are issued for publication." The sub-committee included in its reports a list of the associations, voluntary and otherwise, which it had in mind in making the recommendation for closer affiliation. This list gives the names of the president and secretary of each association, a statement of the nature of its membership and of its objects, and the territory covered. The associations are:

American Railway Association.
Western Railroad Association.
Eastern Railroad Association.
Central Association of Railroad Officers.
Transportation Association of Norfolk, Va.
General Managers' Association of Chicago.
General Managers' Association of Texas.
General Managers' Association of New York City.
General Superintendents' Association of Chicago.
Memphis Association of Railway Superintendents.
Association of Transportation and Car Accounting Officers.
National Association of Railway Agents.
Railroad Agents' Association of New England.
Train Despatchers' Association of America.
American Association of Dining Car Superintendents.
Association of Railway Telegraph Superintendents.
Association of American Railway Accounting Officers.
Bureau for Safe Transportation of Explosives and Other Dangerous Articles.
American Association of Railway Surgeons.
Railway Storekeepers' Association.
American Railway Engineering and Maintenance of Way Association.
Association of Railway Superintendents of Bridges and Buildings.
Railway Signal Association.
Roadmasters' and Maintenance of Way Association.
American Railway Master Mechanics' Association.
Master Car Builders' Association.
International Master Boiler Makers' Association.
International Railway General Foremen's Association.
Master Car and Locomotive Painters' Association of the United States and Canada.
National Association of Car Service Managers.
Central and Western Association of Car Service Officers.
Eastern Association of Car Service Officers.
Southeastern Accounting Conference.

MASTER CAR BUILDERS' TESTS OF BRAKE SHOES.

The accompanying table has been prepared by F. W. Sargent, of the American Brake Shoe & Foundry Company, Mahwah, N. J., to present in convenient form the more important data included in the report of the Master Car Builders' committee on tests of brake shoes, and to introduce interesting comparisons with data presented in the 1907 report by the same committee.

Master Car Builders' Tests of Brake-Shoes.

Laboratory No. of shoe.	Submitted by.	Name of shoe.	Description of shoe.	Area of face of shoe, sq. in.	Percentage, shoe face. Insert.	Chilled.	Unchilled.	Wear of shoe in lbs. per 100 million ft.-lbs. of work absorbed—1908 report. Steel tire. Load equals 1,086	2,808	4,165	1907 report. Chilled steel. Ld = 2,808	Comparative durability — hundreds of ft.-lbs. of work absorbed per 1 lb. of shoe wear, under load of 2,808 lbs. at 20 miles per hour. '08 report.	'07 report.	Mean co-eff. friction, '07 reprt. Load, 6,840 lbs. Speed, 65 miles per hour. Steel tire.	Load, 2,808 lbs. Speed, 40 miles per hour. Chilled wheel.
200.	L. S. & M. S....	Streeter.....	Cast-iron body—white iron inserts.....	45	37	0	63	0.31	0.32	0.31	0.258	3.125	3.870	Not tstd.	22.7
163.	A., T. & S. F...	U Diamond "S"...	Do. —Chilled ends and exp. steel inserts	53	30	13	57	.28	.42	.44	.285	2.381	3.501	14.3	21.7
158.	Hocking Valley.	Streeter.....	Do. —White iron inserts	51	32	0	68	.34	.45	.52	.245	2.221	4.072	13.7	22.5
194.	L. S. & M. S...	Congdon.....	Do. —Oblong wrought steel inserts.....	47	40	0	60	.27	.47	.59	.180	2.124	5.546	Not tstd.	26.5
161.	Hocking Valley.	Streeter.....	Do. —White iron inserts.....	51	32	0	68	.42	.60	.69	.482	1.665	1.466	13.8	21.8
172.	A., T. & S. F...	Seaton	Do. —Circular wrought steel inserts....	45	12	0	88	.43	.86	1.94	.387	1.163	2.582	Not tstd.	22.8
183.	D., M. & N.....	Pittsburgh.....	Pressed steel shell, composition filling.....	45	Shell, 22; filling, 78			.26	1.00	1.44	.575	1.000	1.738	Not tstd.	38.7
205.	L. S. & M. S...	Pl. Cast-iron.....	Unchilled cast-iron.	47	0	0	0	.90	1.39	1.62	1,086	.719	.920	15.0	23.5
179.	W. & L. E.....	Pittsburgh.....	Malleable iron shell, composition filling....	44	Shell, 36; filling, 64			1.30	1.16	2.32	.874	.862	1.143	20.0	36.8

DESPATCHING TRAINS BY TELEPHONE.*

BY W. W. RYDER,
Superintendent of Telegraph, Chicago, Burlington & Quincy.

The electric interurban roads early recognized the desirability of the telephone and they have extended their use of it until it is now recognized by them as the standard method of operation.

The steam roads, however, with their ultra-conservatism, were loath to part with the long established telegraph, and it is only recently that the use of the telephone for this purpose has been attempted on a sufficiently large scale to secure a fair demonstration of its possibilities. The immediate incentive for these experiments was the near approach of the date for the enforcement of the Federal nine hour law, coupled with the well defined shortage of telegraph operators that had existed for two or three years.

The first experiment on the Burlington of handling trains exclusively by telephone was begun on the 11th of last December, on the main line between Aurora and Mendota, 46 miles, and 11 offices. The result was so satisfactory that the construction of another circuit from Aurora to Galesburg, 125 miles, with 16 offices, was immediately authorized to handle the despatching between Mendota and Galesburg. This circuit was completed January 24 and has been in use regularly since that date.

On March 1 the third telephone circuit was completed. This extends from Clyde, the end of the Chicago terminals, to Aurora, a distance of 28 miles, with 15 offices. These three circuits are all on double track.

On March 19, the first installation on single track was completed between Aurora and Savanna, a distance of 106 miles, with 23 offices.

Up to this time, while many who personally investigated the matter were willing to concede its efficiency as applied to double-track operation, they were very skeptical as to what would be the result on single track. In this distrust, they overlooked the fact that in our method of double-track operation, the irregularity of reverse movements in reality made the requirements on such lines more exacting than on single track where opposing movements were perforce the regular method of operation. The results of this last installation were even more marked than on double track, and I am convinced that the handling of trains by telephone is not only much more satisfactory, but is really safer as well, and this opinion is shared by all who have personally looked into the matter.

We use two 210-lb. copper wires and have made the installation as complete and perfect as we know how. With the present market price of copper, the telephone circuit costs approximately $100 a mile and the station equipment about $50 per station. This is more expensive than the telegraph circuit, and the maintenance will be a little more difficult and the cost a little higher, but the results have proven so absolutely satisfactory we feel the additional expense is fully warranted.

Our arrangement makes the circuit entirely self-contained, that is, the signaling and talking is all done on the same pair of wires. The signaling is done by semi-automatic selectors that enable the despatcher merely by the depression of a couple of buttons in connection with a series of synchronous clocks to ring at will vibrating bells in one or more offices on the circuit. This is a much less laborious method of calling, and we also find a very great saving in time, the operators responding very much more quickly than is the practice with the telegraph. In the local offices we put a 4-in. vibrating bell, one large enough to be heard at a considerable distance, and when this bell lets go without any preliminary warning, the one thought of the operator is to shut it off and so he immediately answers the call. More often than otherwise the operators to avoid the annoyance of the signal bell forestall the despatcher's call and report trains as soon as they pass.

In handling orders, the same general methods are observed as with the telegraph, any figures or names of stations occurring in the order being spelled out letter by letter, both in the giving of the order and all of the repetitions, and the name of the conductor on a "31" order is spelled out as well.

The use of the telephone is so quick in every way, and so much more flexible, the despatcher is enabled to get far more detailed information of just exactly what each train is doing, even, when occasion requires, talking directly with the conductor or engineer personally, and is thus brought just so much nearer the actual details of train movement. Only a personal investigation of the scheme can show how valuable is this information.

There has also been a marked improvement in the work of the men on these telephone circuits due to the fact that the conversations between the despatcher and the operators or other employees are of a much more personal character than obtains with the telegraph, resulting in much closer co-operation.

It is even possible to save considerable time in the actual putting out of orders. The despatcher copies the order in his order book as he talks it off, thus gaging, or rather reducing, his speed of conversation to his ability to write it down, as well as the ability of the operators to do so. Then when the operators repeat the order, they talk it off as fast as they can or much faster than is possible by telegraph.

The change in method in every case was made without a hitch and without any opposition worth mentioning. I had an idea that while possibly the despatchers themselves might not openly oppose the change, their support might be of a passive character, but in this I was agreeably disappointed. The first circuit had not been in operation a week before a little spirit of jealousy was evidenced, directed against the despatchers on the telephone circuit, it being so clearly evident they had the "snap" of the office. Soon all the despatchers in Aurora office were desirous that we give them the same facilities, and now that all have been taken care of, there is not one out of the 12 that would willingly go back to the old method.

It is far easier to train telephone operators than to secure telegraphers. There is hardly a town anywhere on the line in which there are not young fellows, who by reason of their frequently being around the depot, are more or less familiar with the railroad game, and who with a very little training would be perfectly competent to sit in as telephone operators. There is much to be gained by making use of men in their own home towns, or who have grown up along the line. Our telegraph service was at its best when this condition existed to a considerable extent, and discipline has lessened in proportion as we have been compelled to import telegraph talent.

This increased use of the telephone has also opened an avenue whereby we can offer better employment to those unfortunately injured in our service, few of whom in the past have been able to learn telegraphy.

Another item worthy of consideration is the broadened field from which we can make despatchers. In the past, the first requisite for a despatcher was an ability to telegraph, and with the character and ability of telegraphers in general dropping as fast as it has during the past two or three years, we certainly can but expect difficulty in the future in getting satisfactory talent, even if this difficulty has not been greatly evidenced in the past. I maintain that a good, bright, young freight conductor, who has been actually carrying out the train orders, would make a better despatcher himself and be better able to assist in getting other trains over the road than is the telegraph despatcher, who, in spite of his occasional trips on freight trains, is a theorist after all.

The establishment of telephone circuits enables us to close unimportant offices wholly or a portion of the time, as a telephone instrument can be placed where the train conductors can readily get in touch with the despatcher.

Another important feature in the use of the telephone is the fact that it works even better in bad weather than in good—just the reverse of the telegraph—and if there is ever a time when good service is needed, it is when the weather is wet and foggy. There is no exasperating interference with the despatcher's efforts by reason of the relay in some way office being out of adjustment and the inattentive operator making no effort to see whether this is the case or not. The telephone is always in proper adjustment and because of the lowered static capacity of the circuits, works as if charmed.

With the telephone it is possible to arrange apparatus, for

*Read before the Convention of the Association of Railway Telegraph Superintendents, at Montreal, Que., June 24.

instance in the Superintendent's office, so that he can at any time listen to the actual work of the despatchers and operators and thus check up any tendency to slackness. This has not always been possible in the past, as not all Superintendents were telegraphers.

The improvement in the handling of train despatching by telephone has been so clearly demonstrated, we have decided to attempt to handle other messages in like manner and in a short time all business for the way offices on certain portions of our line (both main and branches) will be handled by telephone, this to include Western Union business as well. At junction points where branch telegraph lines are to be worked and at certain wire test offices, it may be necessary to maintain telegraph service, but at all other points all classes of business will be handled by telephone.

The field for substituting the telephone for the telegraph daily opens up before us almost faster than we can comprehend it, and the results we are obtaining from our experiments are a constant but very agreeable surprise. For instance, only about a month ago it seemed next to impossible to get satisfactory telephone service on single-wire branch lines without completing the metallic circuit and this the volume of business did not warrant. But within the last few days we have made successful substitution on two branch lines, one 18 miles long with three offices, and the other 49 miles long with ten offices. These branch wires have been so arranged that while not connected permanently with the main line, they can be connected at the will of the despatcher or the way office operator, the signaling on the branch being done by means of ordinary bridged bells.

The unqualified success of our experiments with the telephone as a substitute for the telegraph, and the rapidity with which other roads are extending the work, convinces me that the next few months will make a great change in method of handling trains all over the country, one that will greatly benefit the service.

DOINGS OF THE MASSACHUSETTS LEGISLATURE.

The Massachusetts legislature was prorogued June 13. It rejected all of the proposed legislation in regard to the merging of the Boston & Maine Railroad with the New York, New Haven & Hartford. No other business before the legislature equalled this in apparent importance. In one form or another it was before three committees, taken there by the extraordinary vigor of the main opponent of the merger, ex-Senator William B. Lawrence, of Medford, of the well-known Lawrence family which is supposed to be one of the largest owners of Boston & Maine stock. The matter was before the railroad committee naturally; before the street railway committee on matters connected with the holding of trolley lines, and before the committee on banks and banking on Lawrence's petition that savings banks be forbidden to invest in the bonds of the New Haven road on account of the alleged unbusinesslike way in which President Mellen and the management generally were mismanaging the affairs of the company. After the conflict, it seems, from a survey of the field and a gathering of opinion, as if the railroads played their game against the legislature and won. The committee's bill would have held the conditions unchanged for two years or until it could be determined what it was best to do. As it is, the case is left to the courts. On Saturday Attorney-General Malone filed in the Supreme Court a statement that the New Haven was acting contrary to the laws of the state and to public policy in holding stock of the Boston & Maine and he asked for an injunction to prohibit the road from further exercise of its franchise, or from holding the stock or receiving any proprietary or beneficial interest therein, and from voting the stock of the Boston & Maine. It is a common opinion that the road can prolong the case for years in the courts and so get time to dispose of its stock to advantage or get further legislation if necessary. Railroad representatives at the state house believe that the New Haven and the Boston & Maine are both pleased with the result.

Closely associated with the merger case, in the last days of the session, was the bill to permit the New Haven road to continue its holdings in the Berkshire electric railway company and in the Bennington and North Adams electric railway company, and to permit these two companies—in each of which the New Haven owns stock—to unite. The bill also contained permission to connect the Berkshire trolley system with that in the eastern part of the state, from which it is now wholly shut off, and to make extensions north, south and west. It was estimated that the bill called for the expenditure of $2,000,000 and the prosperity of Berkshire county was claimed to be at stake. Strong petitions were presented from the hill towns which were to be benefited and a moving appeal was made for this favor to the New Haven road and this great boon to poor Berkshire. After stout opposition the Senate passed the bill by one majority. But the moral sense of the House was of sterner stuff. Mr. Hobson, of Palmer, said that it would be outrageous to give this condonation of crime to the New Haven road when the sheriff was on his way to enforce the law for past offenses. Other speakers took the same view and in spite of the Berkshire representatives the bill was killed by a large majority.

Other railroad business of the session has not been of first importance. There has been passed a bill to provide that express companies which use the facilities of the railroads shall be under the supervision of the railroad commissioners in regard to their charges, the same as the railroads are.

Serious modification has been made in the anti-stock-watering law, presumably for the benefit of the Boston & Maine, for that road was the particular example which was cited as an illustration of the injurious working of the present law against the issue of new stock at par. It was said that for years the Boston & Maine has found it impossible to get the necessary capital for the development of its business because of the law requiring the sale of new stock at a price as close to the market price as the railroad commissioners shall judge to be fair. The bill which was passed permits the new stock to be offered to the stockholders at such price, not less than par, as shall be determined by the stockholders themselves, except that, in case the issue does not exceed 4 per cent. of the outstanding issue, the directors may sell by auction to the highest bidder without first offering the stock to the stockholders. This bill was strongly opposed by influences which favor the present anti-stock-watering law which was passed in 1894.

Another bill provides that in computing the capital stock of a railroad or electric railway company for the purpose of determining the amount of bonds which may be issued, there may be reckoned the cash premiums which have been paid in on account of the prices above par which have been charged when the stock was issued in new blocks. This increases the nominal stock considerably, in cases of the corporations whose stock has been selling at a high figure. It is feared that this is also to be used as a precedent for similar legislation for gas and electric light companies.

The usual petition for a law to increase the number of brakemen on freight trains was referred to the next legislature.

There has been passed a bill establishing a zone of 15 miles around Boston within which tickets good for 12 rides shall be sold at the same rate per mile as the existing 25-ride tickets, and the provision is retained for the present 25-ride tickets for the convenience of customers who prefer to buy their transportation in larger amounts.

Several petitions hostile to the railroad commissioners from their abolition and the substitution of a new board down to a petition to compel them to hold meetings in different parts of the state, have all been acted upon adversely.

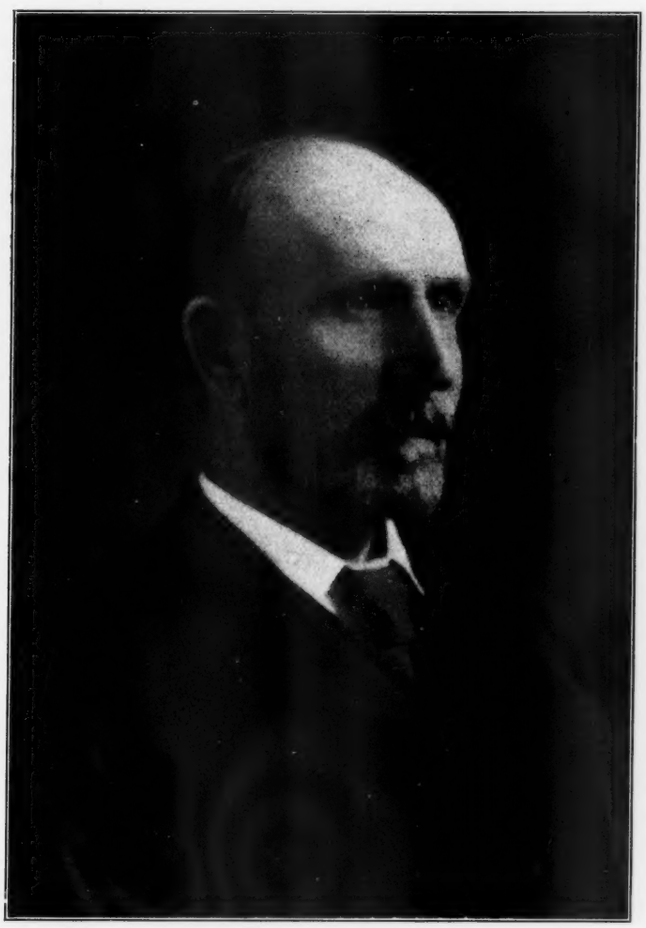
A bill passed by the House to put 70 per cent. of the cost of abolishing a grade crossing on the railroad corporation, reducing the cost of the city or town by the 5 per cent. extra put upon the corporation, but it did not become law.

The petition for a law to prevent savings banks from investing in the securities of the New Haven Railroad was acted upon adversely.

The finances of Russia have been a subject of discussion in the Duma, and the government was asked whether the railroads would be likely soon to exercise a favorable influence on them. The Finance Minister replied that there was no such prospect. Whether the State Railroads could be managed to better advantage or no, he could not decide. The Duma appointed an investigating committee to try to discover why the railroads are so inefficient and at the same time so unprofitable.

SIR ROBERT G. REID.

Sir Robert Gillespie Reid, chief owner of the Newfoundland Railroad, and called the principal benefactor of that island, died at his home in Montreal, Canada, June 3, at the age of 66. Mr. Reid was born in Coupar Angus, Scotland, and his first business venture was in gold mining in Australia in 1865. After six years there he came to America and, in the ensuing 10 years, carried out many important contracts for building bridges and railroads. The first one was the construction of the International bridge across the Niagara river at Buffalo. After that he took large contracts for work on the Montreal, Quebec & Ottawa, the Southern Pacific in Texas, the Canadian Pacific north of Lake Superior, and in other places nearly as widely separated as those here mentioned. He built the bridges on thousands of miles of the Canadian Pacific. Sir Robert's activities in Newfoundland began about 1890, when he took the contract for building the Hall's Bay Railroad, 260 miles long. On the completion of this work he undertook the construction of the Western Railroad which, with the Hall's Bay and the lines formerly built, became the trunk railroad of the island, nearly 600 miles long. In 1898, the government being weak financially, he contracted to operate all the roads on the island for 50 years, paying to the government a large sum in cash and receiving grants of land amounting to over 4,000,000 acres. He also received important subsidies on account of his mail steamers, and took control of stocks and other public works. Included in the land conveyed to him were large tracts of coal, so that with coal mining and the lumber interests and the railroad operations, Mr. Reid became the dominating personage in the whole business of the island. About seven years ago the property in Mr. Reid's control was transferred to the Reid-Newfoundland Company. By the contract with the government this company will, at the end of 50 years from 1893, and by payments aggregating about $6,000,000, become absolute owner of the railroads which it operates.



Courtesy of The Montreal Standard.

Sir Robert G. Reid.

As before said, Mr. Reid was called a benefactor of Newfoundland, and he was knighted by King Edward last year. Notwithstanding the great economic benefits to the island resulting from this development of its resources, there was severe criticism of the legislature for the contracts which it made with Mr. Reid and he himself was personally denounced; but it was conceded that the government had been honestly dealt with and that the railroads and other properties were wisely managed.

The railroad in German Southwestern Africa from Swakopmund to Windhak was built with a 2 ft. gage, and so far has served chiefly as a base for military operations against rebellious natives. It is now decided to reconstruct it with 3-ft. 6-in. gage, which is that of the Cape Colony railroads, with one of which it will connect. The railroad is now 236 miles long.

COAL BRIQUETTES AND THEIR USE IN RAILROAD, MARINE AND DOMESTIC SERVICE.

BY F. R. WADLEIGH,
Fuel Expert, Castner, Curran & Bullitt.

II.

Railroad Tests.—Numerous tests of briquettes have been made by railroads in the United States, notably the Missouri Pacific, the Rock Island, the Burlington and the Pennsylvania, the tests on the latter road at the Altoona testing plant. Excellent results were obtained on all these tests, the briquettes making a much better showing than the raw coal, although in the case of the Western roads, they were made of unwashed slack, while the coal tested against them was lump. The reports of these railroad tests are not yet available, but will shortly be published by the Geological Survey.

As an example of results that may be obtained, however, it may be said that, on locomotives of one railroad, tests of briquettes made from a coal containing 19.83 per cent. ash and 4.55 per cent. sulphur showed an equivalent evaporation per pound of dry coal of 9.18 lbs. on a combustion rate of 76.2 (lbs. of fuel per sq. ft. of grate per hour) the B.t.u. per lb. dry coal being 11,473. Locomotive tests are now being made on the Chesapeake & Ohio, the Seaboard Air Line and the Atlantic Coast Line. Each of these roads sent several carloads of their coal to the testing plant at the Jamestown Exposition, where it was briquetted, the Chesapeake & Ohio sending New River coal; the Seaboard Air Line, Pocahontas coal, and the Atlantic Coast Line, Kanawha coal.

On the Seaboard Air Line a preliminary trial was made of round (Renfrow) briquettes, made from No. 3 Seam Pocahontas coal, and further and exhaustive tests were made of both round (Renfrow) and square (English) briquettes; the latter tests were under the direction of the U. S. Geological Survey Engineers, and the results and data are not yet available.

The preliminary trial, however, was reported on as follows, by the observer:

Distance, miles	175
Schedule time, hours	7
Number of cars hauled	5
Number of stops made	29
Briquettes used, lbs.	12,150
Per cent. of refuse	7.4
Briquettes used per car mile, lbs.	13.88
Briquettes used per engine mile, lbs.	69.3

The same locomotive, on return trip, same engineman and fireman, using R. O. M. coal from same mine, hauling five cars, showed as follows:

Total coal used, lbs	14,900
Coal used per car mile, lbs.	17.03
Coal used per engine mile, lbs.	85.1

Conclusions.—1. When engine was fired properly, there was no trouble in keeping up steam.

2. The fire was not touched with the hook during entire run of 175 miles.

3. Grates were shaken five times during run.

4. There were no large clinkers formed.

5. The consumption of fuel was much lower with briquettes than with coal.

6. There was absolutely no smoke when using steam. When shut off, the smoke was about the same as with loose coal, but the amount could have been much reduced with proper handling of fire.

7. The blower was not used during entire trip.

8. There was a much smaller amount of cinders thrown out of the stack with briquettes than with loose coal.

9. The cinders thrown out were nearly all earthy matter, with very little unconsumed coal.

10. The netting in front end was not clogged up.

11. The work of the fireman was much easier with briquettes.

12. The temperature in the firebox can be kept more even with briquettes.

13. Flues will not get stopped up so quickly when using briquettes.

14. Brick arches will last longer with briquettes, owing (a) to more even heat in firebox, (b) no hooking of fires, (c) no piling up of coal and ashes on top of arch.

15. Coal boards should be used instead of chains to prevent fuel from rolling down too fast.

16. The percentage of slack in briquettes after being put in tenders is very small, probably not over 3 per cent.

17. The briquettes will nearly all roll down into coal pit of tender, so that there will be almost no fuel to be shoveled off top of the tank.

18. Most of the firing with briquettes should be done on the back part of the firebox (nearest door) as sufficient briquettes will roll to the front to keep fire thick enough there.

19. With the briquettes used on these tests the grates should be shaken about every 30 miles in passenger service.

20. It is much easier to keep a level, even fire with briquettes.

21. Not so much draft is needed with briquettes, as they do not coke together in burning.

22. The amount of carbon or partly burned coal in the refuse is much less with briquettes than with coal.

23. Wetting briquettes does not affect their burning.

R. E. Smith, General Superintendent of Motive Power of the Atlantic Coast Line, has furnished the following data regarding the briquette tests made on locomotives of that road in passenger service. These briquettes were made from Kanawha, W. Va., coal shipped from the Dietz Colliery Co.

"I have the following to offer in favor of the new briquettes, which I have been testing since December 15;

"First.—This coal all burns up, leaving no dirty fire at the end of the trip, with a saving of 30 minutes of time in hostling engine.

"Second.—It does away with all the black smoke while using steam, making very little black smoke when the steam is shut off; this can be overcome by cracking the blower and door.

"Third.—This fuel does away with stopping up of flues, and the use of slash bar.

"Fourth.—This fuel produces a uniform steam pressure. I find, however, that the small size of briquettes is much the best. (Small size, Renfrow briquettes.)

"You will remember that the heavy travel of the Christmas holidays was upon us, while making the above mentioned tests, and that a good many delays occurred which we were able to overcome with the use of briquettes as our fuel."

The following is a comparative statement of results obtained from use of run-of-mine coal and briquettes tested for 16 trips on passenger runs between Rocky Mount, N. C., and Wilmington:

	Coal.	Briquettes.
Number of trips tested	16	16
Total number of pounds consumed	172,700	161,980
Average pounds consumed per trip	10,794	10,124
Average tons consumed per trip	5.397	5.062
Total engine miles	1,984	1,984
Total car miles	10,912	12,896
Pounds consumed per car mile	15.8	12.5
Average cars per train	5.5	6.5

On car mile basis briquettes show 20 per cent. better results.

In Europe briquettes are largely used on locomotives and some at least of the railroads, notably the Belgian roads and the Paris, Lyons & Mediterranean in France, have their own briquetting plants. The Belgian railroads have increased their annual consumption of briquettes from 208 tons in 1898 to over 200,000 tons in 1905. On the Paris-Lyons-Mediterranean are both briquettes burned alone, and it has been found possible to use as high as 70 per cent. slack coal on locomotives by mixing briquettes with the slack and using them to build up the fires. In Mexico, the Mexican (Vera Cruz) Railway has for years used nothing but briquettes, which are imported from England and cost considerably more than would high-grade coal from the United States.

The reports to be issued this year by the Geological Survey will give detailed and accurate reports of the locomotive tests of briquettes made during the past year in this country under their direction, and it is to be hoped that the railroads now making briquette tests will give the engineering world the benefit of their work and findings.

Tests on U. S. S. Connecticut.—There follows a detailed description of two tests made in December, 1907, the first with briquettes made from Pocahontas coal, the second with briquettes made from anthracite culm.

1. Briquettes from Pocahontas Coal.

Coal.—The briquettes used were made from CCB (Castner, Curran & Bullitt) Pocahontas coal, as supplied to the U. S. Navy, the four carloads used coming from the Baby Mine, Pocahontas Consolidated Collieries, ROM coal. This coal was shipped to the U. S. Geological Survey testing plant at the Jamestown Exposition, where it was briquetted, 90 tons of briquettes being made on the Renfrow (American) machine and 60 tons on the Johnson (English) machine.

The briquettes made by the Renfrow machine are cylindrical in shape, 3¼ in. in diameter and 3 in. thick, with spherical ends. Their weight averaged 12 oz. each. The briquettes made on the English machine are rectangular in shape, 4¼ in. x 6½ in. x 3½ in., and weighed about 3½ lbs. each. The binder used was water gas pitch, 6 per cent. by weight.

Loading and Handling.—The round briquettes were dumped in the railroad cars from wheelbarrows and were taken directly from the machine as made; the square briquettes, after being cooled, were loaded in the cars by hand. The cars went to the Portsmouth Navy Yard, where they were unloaded, the briquettes being put in bins from which they were wheeled on board a barge. The barge was then towed to Lamberts point and the briquettes in bags put on board the U. S. collier "Abarenda."

The "Abarenda" was then sent to the New York Navy Yard, where the briquettes were unloaded and put on board the "Connecticut."

In spite of the number of times the briquettes were handled, there was little breakage (especially with the round briquettes), much less than there would have been with lump coal. It was, however, impossible to determine the exact amount of breakage, for instead of keeping the briquettes by themselves in the bunkers, the round ones separate from the square ones, as should have been done to insure accurate determination of the amount of breakage, space occupied and furnace value of each kind, the bunkers were filled with coal at New York. Temporary bulkheads should have been built to keep the coal separate from the briquettes, but all that was done to keep them separate was to put loose boards on top of the briquettes. Loose coal was then dumped on the boards.

The slack coal at once sifted down among the briquettes and as soon as some of the briquettes were removed more coal came down, burying the briquettes and making it impossible to get them out entirely free from coal, unless they were picked out by hand, which had to be done in order to get enough briquettes for a two-hour forced draft trial. Some complaint was made of difficulty in handling the briquettes from the bunkers. If they had been kept separate from the coal and the two shapes kept apart, there would have been no trouble of this kind, especially with the round briquettes. It was estimated from the appearance of the briquettes after being placed in front of the boilers that breakage amounted to about 15 per cent. with the square briquettes and about 5 per cent. with the round ones. Complaint was made of the effect of the dust from the briquettes on the eyes of the men, while the former were being put into the bunkers, but there was no evidence shown or complaint made of this by

anyone present during either the natural or forced draft trials.

Boilers.—The boilers on the "Connecticut" are Babcock & Wilcox marine type, rated at 1,000 h.p., each carrying 250 lbs. working pressure, with plain stationary grates. On the tests made with natural draft six boilers were used; with forced draft four boilers were used. The boilers were apparently in good condition, but one of them started to leak in one of the tubes during the natural draft trial and continued to leak through the forced draft trial.

Firing.—The firing was all done by the regular force in the usual way, particularly during the natural draft trial. A mechanical device was used for controlling the firing periods and operations. This method ensured continuous firing operations in each boiler-room and made it certain that at any given time some work was being done on the fires, either leveling, slicing or putting on coal. The time interval therefore between each firing operation was the same for each furnace door and this interval between each operation was the time necessary to perform a similar operation on the opposite door of the other boiler in that fire-room. During the natural draft trial there was an interval of 10 minutes between each operation of putting on coal, while during the forced draft trial this interval was five minutes. By this method, it is evident that a uniform interval of time was used between each firing operation, but a uniform thickness of fire in each furnace was not assured, nor the putting on of the same amount of fuel at each firing.

The fires were kept quite heavy just in front of the furnace door, and considerable leveling was necessary in order to have a more uniform thickness of fire all over the grates. Under natural draft, considerable slicing was also necessary, because of the presence of so much slack coal mixed with the briquettes. This made a surface of solid coke on top of the fire which had to be broken up with the slice bar. Under forced draft, the same amount of slicing was done, although it was not necessary, owing to the absence of any coking of the fire on top.

Methods of Making Tests.—A number of buckets of fuel were weighed and their average taken for the weights of the remainder. The weight of the ashes was obtained in the same way, but the ashes left on grates at end of tests were not weighed or taken into account. Indicator cards, shaft revolutions and steam pressures were taken every half hour. Speed of the ship was calculated from the revolution curve, corrected for variations in draft. The measurement of furnace draft was made in the usual way.

On the forced draft trial the test was started with 2-in. draft. The steam pressure rose gradually to the blowing-off point; in order to keep it down to the working pressure, the revolutions were increased from 80 to 92. As it was the desire of the Chief Engineer to keep the same speed as under natural draft, the steam pressure was then reduced to 225 lbs. and the draft from 2 in. to ½ in.

Smoke records were taken every 15 seconds for 10 minutes for a total of at least an hour during each test. When there was any evidence that conditions did not remain uniform during the test, these records were taken for more than one hour. Photographs were also taken at approximately the same time as the readings. Enough photographs were taken during each test to make a complete record of the smoke conditions during that test.

Results of Tests of Pocahontas Briquettes.

	Draft—Natural.	Draft—Forced.
Duration of test, hours	4	2
No. of boilers used	6	4
Total grate surface, sq. ft.	547.7	365.2
Total heating surface, sq. ft.	26,376.0	17,584.0
Draft, inches, average	Not given	1.26
Steam pressure, engine-room, lbs.	238.	238.
Revolutions, average, per min.	79.8	80.8
Revolutions, maximum	.....	94.0
Average speed, knots	12.45	12.6 14.6
I. h.p. main engines	4,413	4,603
" auxiliaries	315	383
" total	4,728	4,986
Total coal used, lbs.	37,764	20,140
Coal per i. h.p. per sq. ft. grate surface, lbs.	17.23	27.57
Coal per i. h.p. per sq.ft. heating surface, lbs	0.35	0.58
Total refuse, lbs.	2,262	1,240
Refuse, percentage	5.99	6.15
Coal per i. h.p. per hour, all engines, lbs.	1.99	2.02

NOTE.—All observations were taken and results worked out by the ship's engineering force and are given above as furnished by the Chief Engineer.

Conclusions.—1. The advantages in combustion that would have been shown by the briquettes were to some extent neutralized by the mixture of coal with the briquettes. On the natural draft trial it was estimated that there was about 25 per cent. of coal, while on the forced draft trial the amount of coal was probably not over 5 per cent. (Mr. Malcolmson estimates 33 per cent. and 10 per cent. respectively.) This coal was taken on at New York and was Pennsylvania semi-bituminous, making more smoke than ordinary Pocahontas.

2. The loose coal mixed with the briquettes retarded combustion, caused the fires to coke over, added to the percentage of ash and clinker and made it necessary to slice the fires, which is not necessary when burning briquettes alone.

3. There was practically no clinker formed.

4. The percentage of ash was lower than with ordinary Pocahontas coal.

5. The smoke made under the test conditions was about one-half as dense as would have been made with Pocahontas coal. Considerable smoke was due to the firing methods, due to the inexperience of the firemen in burning briquettes.

6. The labor of firing is much less with briquettes than with coal.

7. With round briquettes, as made on the Renfrow machine, there is no trouble in handling from the bunkers to the fire-room, under any rate of combustion.

8. Less draft is needed with briquettes than with coal.

9. Higher furnace temperatures may be obtained with briquettes.

10. By making the following changes in the firing methods even better results with briquettes would be shown:

No slicing of fires.

Less leveling (raking) of fires.

More care in putting briquettes on fires.

Fires kept level over the grates, preferably a little heavier at back than at front.

Less fuel put on fire at each firing.

A uniform quantity of briquettes used at each firing, the amount to be regulated by conditions.

The dust from the briquettes should be kept wet, so that it will not be carried out of the smokestacks.

11. The round briquettes are much preferable to the rectangular ones, as they are more easily handled, do not break so easily, do not have to be broken up, make it easier to carry a uniformly level fire, give the supply of air through grates a more ready access to all parts of the fire and make it possible to carry a deeper fire when necessary because, due to their uniform size, they do not as a whole coke when burning. Each briquette cokes while burning but each burns separately and the briquettes do not run together, as coal does.

12. The rectangular briquettes can be stowed more closely, if the stowing is done by hand. The expense of such handling, however, is prohibitive. If not stowed by hand, it is probable that more of the round briquettes can be stowed in a given space.

13. The weight per cubic foot as stowed will be about 8 per cent. less than with run-of-mine coal, but about the same as with lump coal. On the other hand the number of available heat units per foot of space will be from 10 to 20 per cent. greater than with run-of-mine coal. This latter fact means a greater steaming radius per ton of fuel.

14. On the trial of the "Connecticut" made with Pocahontas coal in the summer of 1907, 128 revolutions per minute was the average during the trial, with 12 boilers in use. On the briquette test, 79.8 revolutions per minute was the average, using four boilers, while at one time 94 revolutions were made, and it is reasonably certain that 94 revolutions could have been kept up throughout the trial.

As stated above in report, the firing was done by the regular force in the same way as with coal. These methods were not at all suitable for briquettes; they increase the consumption, the smoke and the amount of refuse. The fires were sliced and leveled much too often, entirely too much fuel was put on at each firing, the fires were not carried level, and the fuel not properly distributed over the fire.

2. BRIQUETTES FROM ANTHRACITE CULM.

The briquettes were made from Pennsylvania anthracite culm, which was shipped to Swansea, England, and briquetted in an English machine, by the Swan Smokeless Fuel Co. They were rectilinear in shape, measured 10 in. x 12 in. x 4½ in., and weighed about 22 lbs. each.

Binder.—The binder used was coal tar pitch, percentage used not known, although from their appearance it is prob-

able that they contained more binder than did the Pocahontas briquettes.

Loading and Handling.—The briquettes were loaded into ship directly from the fuel company's wharf, unloaded at New York Navy Yard and loaded by hand into the bunkers of the "Connecticut." They were taken out of the bunkers by hand, so that no loose coal was mixed with them on the test. But owing to their size it was necessary to break them up with sledges before using and it was impossible with the regular force of coal passers to keep a sufficient supply in front of the boilers. A large supply of the briquettes was brought into the fire-room before starting the test, but even then it was necessary to put on a double force of coal passers. Each briquette was broken into three to six to eight pieces before firing.

Breakage.—The breakage was small, not over 2 per cent. When the briquettes were broken before firing, the break was clean and no slack was made.

Boilers Used.—Same as with Pocahontas briquettes.

Firing.—During the natural draft trial, the same firing methods were used as are customary with raw bituminous coal, the rate of combustion being very low. During the forced draft trial, the fires were not sliced so often and a considerably thicker fire was carried. In both trials a considerable amount of partly burned coal fell through grates.

Methods of Making Tests.—Same as with Pocahontas briquettes.

Results of Tests of Anthracite Culm Briquettes.

	Draft.	
	Natural.	Forced.
Duration of test, hours	4	6
No of boilers used	6	4
Total grate surface, sq. ft.	547.7	365.2
Total heating surface, sq. ft.	26,376	17,584
Draft, inches, average	Not taken	1.47
Steam pressure, engine room, average lbs.	165	233
Revolutions, average per min.	52.9	63
Revolutions, maximum per min.	.....	.....
Average speed, knots.	8.26	9.9
I. h.p. main engine	1,352	2,239
" auxiliaries	224	375
" total	1,576	2,614
Total coal used, lbs.	36,072	60,030
Coal per hour, lbs.	9,018	10,070
" " i. h.p. per sq. ft. grate surf., lbs.	16.46	27.40
" " i. h.p. per sq. ft. heating surf., lbs.	0.36	0.58
Total refuse, lbs.	7,600	15,900
Refuse, per cent.	21.07	26.48
Coal per i. h.p. per hr., all engine, lbs.	5.72	3.82

NOTE.—During these trials, the evaporators had to be shut off. The Chief Engineer estimated this to be equivalent to two tons of coal per hour.

Conclusions.—1. The cost of handling these anthracite culm briquettes is prohibitive, particularly under forced draft.

2. The breakage in handling was practically nothing.

3. Smoke did not get above No. 1 Ringelmann chart.

4. The percentage of ash was excessive.

5. Steam and speed could not be kept up to the maximum.

6. Better results would have been attained with different method of firing, but

7. High speed and steam pressure could not be maintained, nor could the briquettes be handled quickly enough as required.

8. Fires could not be banked.

9. It would take at least two hours with them to get up steam in a cold boiler.

10. Under forced conditions it would be impossible to get the refuse from furnaces overboard without seriously interfering with the firing.

Other United States Navy Tests.—In addition to the tests on the United States steamship "Connecticut," further and more exhaustive tests are now being conducted at the Norfolk Navy Yard by the Navy Engineering officers in conjunction with Messrs. Ray and Kreisinger of the Geological Survey. A preliminary trial was also made on October 26, 1907, on the torpedo boat "Biddle," having on board the National Advisory Board on Testing Materials, the run being made from the Norfolk Navy Yard to the Virginia Capes and back. Pocahontas coal, run-of-mine, was used under one boiler and briquettes of New River coal, with 7 per cent. of coal tar pitch as a binder, under the other. The firemen were all green. Under the conditions a good showing was made by the briquettes. No accurate records were kept on this trial, the following being the only figures obtained:

	Coal.	Briquettes.
Tons used	3½	2¾
Revolutions per min.	....	8 p. ct. more.
Draft, inches.	2	1
Steam pressure, lbs.	80 to 120	140 to 180

Advantages of Briquettes.—The following are the advantages that can be proved for briquetted coal as compared with raw coal, as regards combustion:

1. Greater efficiency may be obtained per pound of fuel.
2. More water can be evaporated per pound of fuel.
3. From 20 to 40 per cent. greater capacity can be developed under any given boiler.

These statements have been proved by actual tests, and are mainly due to the following facts:

Briquettes are of a uniform size and texture, do not crack or split when burning, and do not cake together on the fire but retain their shape until consumed.

Their uniformity of size permits admission of air evenly all through the fire; as they do not split when burning, there is no disintegration of fine coal to stop up air spaces; as they do not cake, there is no necessity for slicing fires which is the fireman's hardest work, but a necessary evil under many conditions, especially in marine service.

There is much less formation of clinkers to stop up air spaces and retard combustion. What clinker is formed is usually in small pieces which can be handled through the grates.

Briquettes burn with little or no smoke. Starting to burn from the outside, the hydro-carbons are driven off gradually and uniformly and have an opportunity to mix with the necessary amount of oxygen so that there is almost complete combustion. This is also shown by the fact that higher furnace temperatures may be obtained with briquettes than with raw coal. Tests have shown as high as 3,200 deg. F. furnace temperature.

Other ways in which briquettes are superior in combustion in all kinds of service, marine, stationary and locomotive, are as follows:

a. Greater regularity in firing.

b. More uniform steam pressure.

c. Less cleaning and stirring of fires, hence less opening of furnace doors.

d. Less draft needed for same rate of combustion.

e. Less soot deposited on heating surfaces, hence less cleaning of tubes.

f. Much less loss from fine coal falling through grates and from partly burned coal in ashes. Tests have shown this as follows:

On Locomotive.	Briquettes.	Lump coal.
Combustible in total refuse	17.66 per cent.	26.97 per cent.
Earthy matter, total refuse	82.34 "	73.03 "
On Stationary Boiler.		
Combustible in total refuse	32.77 "	45.43 "
Earthy matter	67.23 "	54.57 "

g. Grates will last much longer.

h. Less moisture to be evaporated.

i. Easier work for the fireman, on account of uniform size and quality, less stirring of fires and less cleaning of fires, easier to shovel and do not have to be broken up.

j. Boilers can be forced harder and a higher rate of combustion attained.

k. Steam can be raised to a higher pressure more quickly, when low, or can be raised more quickly in a cold boiler.

l. Combustion chambers, bridge walls and side walls or arches will last longer and be kept clean more easily.

In stationary boiler work, as good or better results in fuel economy and boiler efficiency may be obtained with hand-fired furnaces burning briquettes as with automatic stokers using similar coal not briquetted.

The following are special advantages of briquettes in locomotive service:

a. Much fewer sparks or cinders drawn into front end and thrown out of the stack. In such cinders the percentage of combustible matter is much less than from raw coal, as shown by actual tests as follows:

	Lump coal.	Briquettes.
Combustible in front end cinders	52.73 per cent.	17.66 per cent.
Earthy matter in front end cinders	47.27 per cent.	82.34 per cent.

This means to railroads large reductions in fire damages and claims.

b. Fewer leaky flues and fireboxes on account of more even firebox temperatures and greater regularity in steam pressure and firing.

c. Fewer delays to trains on account of no steam, dirty fires and poor coal, and ability to make up more time when delayed, which means greater operating efficiency and quicker movement.

d. As briquettes require less draft, the diameter of exhaust nozzles could be increased.

The following is a summary of the special advantages of briquettes in marine service:

a. Equally suitable for either natural or forced draft.
b. Will keep up fires for longer periods without cleaning.
c. No slicing of fires (the marine fireman's hardest work).
d. More knots made to ton of fuel.
e. Less fuel used per i.h.p.
f. Comparative absence of smoke.
g. Less ash and clinkers to be handled.
h. Ability to keep up fires for long periods without cleaning.
i. Less draft needed.
j. More uniform steam pressure.
k. Less labor in handling.
l. Less sweeping of tubes.
m. No liability to spontaneous combustion, hence lower insurance rates.
n. Uniformity in quality.
o. No burning out of grates.
p. Less loss from fine coal falling through grate.
q. No deterioration in storage or from weathering.
r. More fuel can be burned per sq. ft. of grate surface and capacity of boiler increased from 20 to 40 per cent.
s. Steam pressure can be increased much more rapidly.
t. Steam may be raised to any given pressure in much less time.

In storing, handling and transportation, briquettes show these advantages:

a. More heat can be stored per foot of space.
b. Absolute freedom from spontaneous combustion.
c. No deterioration from weathering or in storage.
d. Less loss from slack and breakage in handling.
e. Cars may be unloaded more quickly. On actual test, a 50-ton hopper bottom car of briquettes was unloaded in 15 seconds, a 40-ton flat-bottom car with four doors was unloaded through the doors by four men in 25 minutes. This means less labor at coaling stations.
f. Fewer cars and less labor for loading ashes.
g. Easier to measure in any quantity.

These are the general advantages in the use of briquettes:

a. Lower freight rates on fuel cargoes.
b. Lower insurance rates on ships carrying fuel.
c. Ability to keep large reserves on hand.
d. Ability to regulate output.
e. Ability to blend different grades of fuel.
f. Ability to use parts of coal seams now rejected.
g. Opportunity for advertising product by impression on briquettes.
h. Guarantee of quality by trade mark on each briquette.
i. Cars may be loaded automatically direct from machine.

Briquette Specifications.—The following statement is made by the Geological Survey of the requisites of a briquette for general use:

1. The cost should be little, if any, more than that of the lump coal of the same kind as that from which the briquette was made.

2. The strength and binding material of the briquette must be such that it will (a) bear handling and railroad transportation without serious loss from crumbling, (b) stand exposure to the weather without serious deterioration, and (c) retain its shape in the fire.

3. Its density should at least equal that of the lump coal from the same mine and if possible should exceed it. It should not absorb more than 3 per cent. of water.

4. It should ignite readily and burn with a good intense flame, and as nearly as possible without odor or smoke.

5. Its heating value should not be less than that of the best lump coal from the same mine.

6. Its ash should not exceed that of the best lump coal from the same mine.

7. The size of briquettes will vary according to the purposes for which they are intended and with other local conditions.

To these required characteristics may be added the specifications issued by the French Navy and the Belgian State Railways:

1. The briquette must be hard, homogeneous in density and size, only very slightly hygroscopic and should burn almost without smoke or odor.

2. The dust and breakage caused by handling and transportation should not exceed 5 per cent.

3. The specific gravity should not be less than 1.19.

4. The briquette should ignite readily, burn with a bright flame and retain its shape until completely burned.

5. The ash should not exceed 9 per cent. and the evaporation results should at least equal those of the best lump coal from the screenings and dust of which the briquette was made.

The tests of binders by the survey at St. Louis showed that the coal tar pitches made the most satisfactory binders as they are relatively cheap, make strong briquettes, stand exposure to the weather, are easily handled, more easily procured, increase the heating value of the fuel, do not give off fumes while burning and do not increase the clinker formation in the ash. Almost all of the briquettes made at the Jamestown Exposition were made with coal tar or water gas pitch as binders.

The reports of the Survey give no facts regarding costs. As stated by their briquetting engineer, C. T. Malcolmson, their work was mainly "to discover what could be done with briquettes, provided they could be made commercially, under the conditions now existing in this country." As a result of their work at St. Louis, we know (as also stated by Mr. Malcolmson):

1. That practically all of the coals in the United States can be briquetted successfully.

2. That coking coals make better briquettes than non-coking coals.

3. That low volatile coals are improved by briquetting with pitch.

4. That the physical structure of the coal plays a most important part in its adaptability to briquetting. Those coals having a columnar structure, such as the semi-anthracite of Arkansas and the high-grade, low volatile coals of Pennsylvania and West Virginia make the best briquettes.

5. That these latter coals briquetted will compete successfully with anthracite coals.

6. That briquettes produce less slack in handling than the coal from which they are made.

7. That briquettes will evaporate from 10 to 20 per cent. more water per pound of fuel than lump coal from the same seam.

8. That, burned properly, they are almost smokeless, make very much less clinker, and are cleaner and more easily handled than lump coal.

9. That used in house-heating furnaces they have shown twice the efficiency of anthracite coal in calorific value.

10. That in locomotive service they produce less front-end cinders than loose coal; a much finer ash which is easily shaken through the grates; respond more readily to over-capacity demand on boilers, and are more easily handled and put on the fire.

11. In some cases, briquettes made from raw unwashed slack have made excellent locomotive fuel, while screened lump coal from the same seam could not be used on account of clinkers.

12. That no briquettes have shown any evidence of heating when stored on piles or bins.

13. That all briquettes stand weather better than raw coal. Briquettes exposed to the weather for 18 months showed no appreciable signs of disintegration, while lump coal from same mine would not stand the same test six weeks.

14. The size and shape of the briquettes have an appreciable effect on their efficiency.

15. That efficiency varies with different coals.

Summary.—Briquettes make an ideal fuel for domestic use. They are easily stored, have little dust, give out more heat than loose coal, burn with a brighter flame, make no smoke or soot, take up less space than lump coal and leave nothing but fire ashes.

For the present briquettes are hardly likely to be in general demand for the ordinary steam-making plant, except possibly where smoke-abatement laws are enforced, but for locomotive, marine and domestic use there should be a ready market for them.

To the railroads the use of suitable briquettes would mean a smokeless fuel of uniform quality, no clinkers, plenty of steam, quicker raising of steam, fewer delays to trains, less

cost of handling fuel, elimination of a large proportion of fire damage claims, a fuel that can be easily stored without danger of spontaneous combustion or loss of heat value, easier work for the engine crews and ability to get and maintain a higher rate of combustion than with raw coals. It would seem therefore that it would be good policy for railroads to look into the briquette question very carefully, especially roads that have no coal or only inferior coal on their own lines.

AN EARLY AND THOROUGH TEST OF CONTINUOUS BRAKES IN ENGLAND.

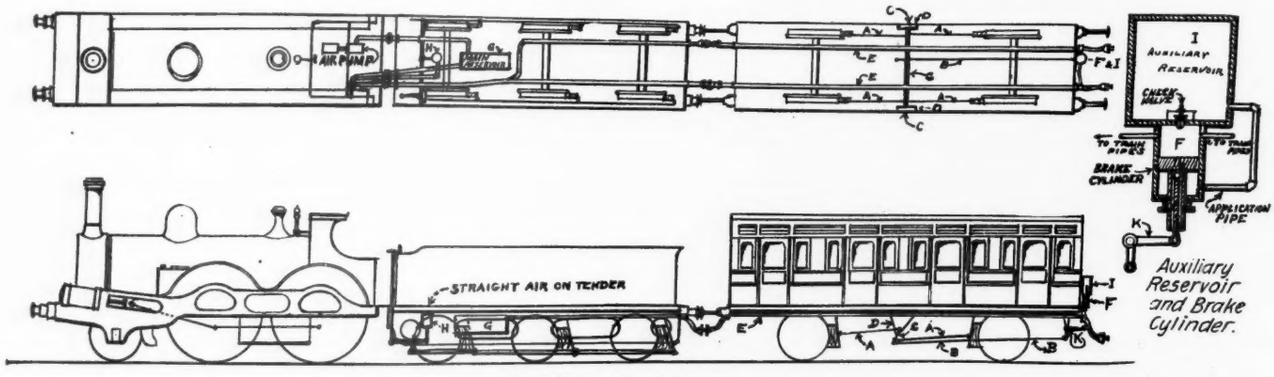
BY C. H. CARUTHERS.

II.

The first of the trains, taking them in alphabetical order, was furnished by the Caledonian Railway of Scotland; the carriages and vans were all four-wheeled and fitted with Steel & McInnes' air-brake. This device was an automatic, or, as one of the technical papers of that day calls it, "positive," type. A steam pump on the foot plate of the engine supplied compressed air to a reservoir under the tender. The carriages and vans were provided with two lines of pipe which were connected between the buffers by rubber hose held in place by pinching screws which were somewhat unhandy in making up a train. On one end of each carriage a casting, comprising a cylinder in its lower part and an auxiliary air reservoir in its upper part, was attached in a vertical position. This cylinder contained a piston from which the rod extended downward through a stuffing-box to the brake shaft. A port in the partition between the cylinder and the auxiliary reservoir was covered by a check valve opening into the latter. The upper end of the cylinder was connected to the lines of pipe already referred to, while the lower end was connected to the auxiliary reservoir by an unobstructed pipe. Thus as long as the train pipes were charged with air, the piston was kept at the bottom of the cylinder, it being obvious that its weight, and also the slightly greater area of its upper side over that of the underside which contained the rod, facilitated this; the brake mechanism was thus held in release position; but when an application was made, either by the engine driver, guard or the accidental breaking of the train, the ensuing withdrawal of air from the upper end of the cylinder caused the check valve to close, and the air in the auxiliary reservoir to force the piston upward and apply the brake. The return of air under pressure to the train pipes, of course, restored everything to the normal condition of release.

The engine of this train had no brake of any sort on the driving wheels, but the tender was fitted with brake-blocks of wood on all of its wheels, and these could be applied either by hand gear or by a cylinder working "straight" air.

The Great Northern Railway train consisted of two vans and two carriages of four wheels each, and 11 carriages of six-wheels each. Three units of the four-wheel equipment were fitted with wooden brake-blocks, but cast-iron was used on all the other wheels, one block to each wheel. Each carriage and van was fitted with the Smith vacuum brake. The train pipe on each vehicle was double and was arranged in two parallel lines, one of which was connected to the rubber cylinders which actuated the brakes, and to the other line at the rear of the train by means of the regular hose couplings. This

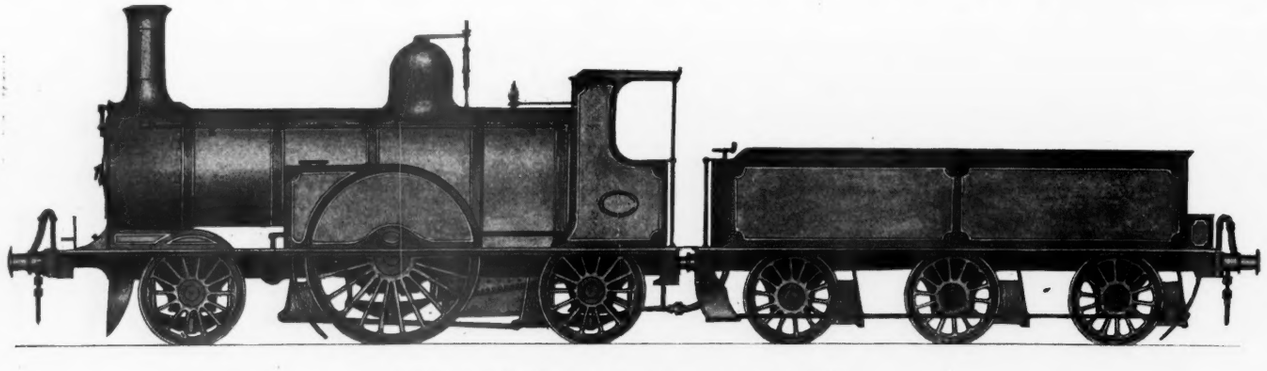


Steel and Innes' Brake.

second line was attached at its front end to two ejectors placed on the side of the engine's smokebox, and also to two Gwynne & Beale "exhausters" which were located in each van as an aid to the ejectors in producing a vacuum quickly. This system of connection enabled the brakes to be set at the rear of the train a little in advance of those at the front, and thus prevented jerking in stopping. The ejectors exhausted the air and steam into the engine's "chimney," as our English friends call it.

The rubber cylinders mentioned were made with cast-iron ends, one of which was rigidly attached to the carriage framing and the other to the brake gear. A number of iron rings on the inside prevented the rubber from flattening out when the air was exhausted, and thus permitted the loose head to move in a horizontal direction and apply the brake.

The exhausters were driven by wire ropes from separate pulleys attached to friction wheels. These friction wheels were held idle by triggers which were so connected by cords to the collapsible rubber cylinders that as soon as the engineman started the ejectors to work the consequent action of these cylinders released the triggers and a powerful spring brought the wheels in contact with other friction wheels on

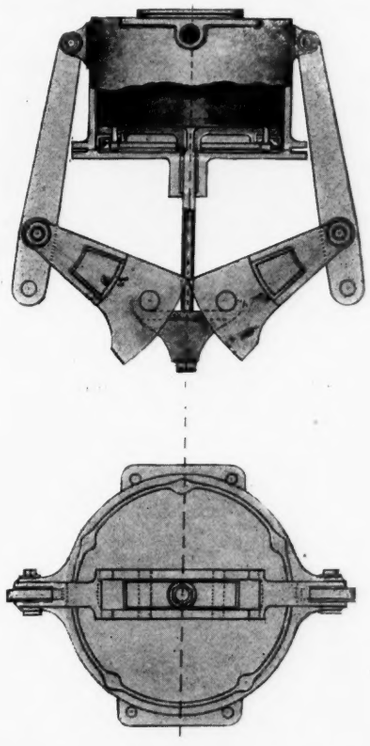


London, Brighton & South Coast Locomotive.

the axles of the vans, and kept them there until again restored to running position. The triggers could also be released by a cord placed within easy reach of the guard or the driver.

The Great Northern engine had no brake on any of its wheels, but its six-wheel tender had wooden blocks, worked by hand gear only, on all wheels.

The train of the Lancashire & Yorkshire Railway was divided, with regard to its brakes, into two sections, each of which could have the wheels controlled independently of the other. The first of these sections comprised a van and six carriages, and the second a van and seven carriages. The entire equipment was provided with Fay's mechanical brake, and all the vehicles were four-wheeled with wooden blocks. The Fay brake consisted of a shaft hung longitudinally under the carriage or van, and having a screw attached to it by means of which the brake levers were actuated. The shafts had square sockets on their ends, and were coupled together between the carriages by a square bar with couplers on its



Westinghouse Vacuum Brake Cylinder and Connections to Brakes.

London, Brighton & South-Coast Railway Tests of June 9-16, 1875

ends shaped to allow them to slip loosely into the sockets on the ends of the shafts, and thus adapt the continuous line to the varying positions of the buffers. The whole appliance was worked by the guards in the vans.

The L. & Y. engine had no brakes on any of its wheels. Its tender was also six-wheeled and all were provided with brakes controlled by hand gear.

The London, Brighton & South Coast carriages and vans were all four-wheeled, with cast-iron brake-blocks fitted to all wheels with especial care. The Westinghouse vacuum brake was used throughout. The carriages were new, and the entire train was generally admitted to be the finest in design and finish of any taking part in the tests. The engine had brakes on the driving and trailing wheels which could be applied by steam or hand at pleasure. The six-wheel tender had wooden brake-blocks on all wheels, but designed for hand gear only.

Another very fine train was that furnished by the London & North Western Railway, consisting of six-wheel carriages with a luggage compartment in the center of each, and six-wheel vans, all new and of the latest type of the company's rolling stock at that time. Brakes were only fitted to four wheels of each van and carriage, but shoes were used on both sides of each wheel. The system of brake used was the Clark & Webb, an improvement of Clark's chain-brake which had long been used on the L. & N. W. Under each van a drum was placed in such a manner as to be revolved when brought in contact with a friction wheel attached to one of the van axles. Chains attached to these drums were carried underneath the carriages and connected to the brake gear, and through the winding of these chains around the drums when set in motion the brakes were applied. While the brakes were released, these drums were held away from the friction wheels by weighted levers kept in the desired position by triggers. Cords leading from van to van, and to the engine, were fastened to these triggers, and when an application of the brakes was desired the guards, driver or any properly authorized person, drew the cord and released the triggers, whereupon the weighted levers instantly threw the drums into contact with the friction wheels and held them there as long as required. As this type of brake is not very efficient on the more remote cars of a long train, that just described was arranged with a van provided with two independent chain-drums immediately following the first four carriages, after which came five carriages, followed in turn by a van with a single chain-drum, and behind this were the remaining four carriages.

Under this arrangement the brakes of the first four carriages, and those of the next five, could be set from the first van, either on all nine at one time or on each section separately as desired. The van behind the five carriages controlled only the brakes of the last four.

The Midland Railway furnished three trains, each fitted with a different type of brake.

One of these trains used Barker's hydraulic brake in which water under pressure in the train pipes was utilized to apply the brakes through the medium of hydraulic cylinders under the train, two cylinders being used on each carriage or van. The water pressure was maintained by the use of a steam "accumulator" on the engine. This device consisted of two cylinders, one of which contained a piston fitted at one end with a plunger which entered into the second cylinder which was kept filled with water, and was connected to the train pipes. To make an application of the brake, hot water was admitted from the boiler into the first cylinder on the side of the piston opposite the plunger. This, of course, forced the water into the train pipes and set the brakes. Release was effected by admitting steam to the plunger side of the piston in the first cylinder, by which the piston was driven back and discharged the hot water used in setting the brakes into the tender. Check valves on the train pipe permitted several strokes of the accumulator to be made while braking. A valve on a pipe connecting the tender and the second, or plunger, cylinder, allowed any waste of water in the train pipes to be replaced after brakes were released.

The engine of this train had brakes on all of its driving wheels and these were also operated by the hydraulic device. The six-wheel tender had all wheels fitted for braking, but used hand-power only.

Another of the Midland trains exhibited Clark's hydraulic brake. The ordinary brake connections under these carriages was of about the same type as that of the L. & N.-W. This brake differed from the Barker, in using but one brake cylinder to each carriage and van, and in the detail and mode of handling the device for retaining the water pressure in the train pipes. With this brake but one hydraulic cylinder was used under each vehicle, all in the trial train being of a diameter of 6 in., except one, which was of but 4 in. The water pressure was maintained by an arrangement of two cylinders on the footplate of the engine. The lower one occupied a vertical position and was provided with a deep piston, while the second was attached to the first near its upper end, at right angles, thus standing horizontally. This cylinder contained a plunger. A supply of water was maintained in the portions of the two cylinders between the piston and plunger, and also in the outer end of the second cylinder, and in the train pipe by a pipe connected with the tender. This pipe contained a check valve opening toward the cylinders.

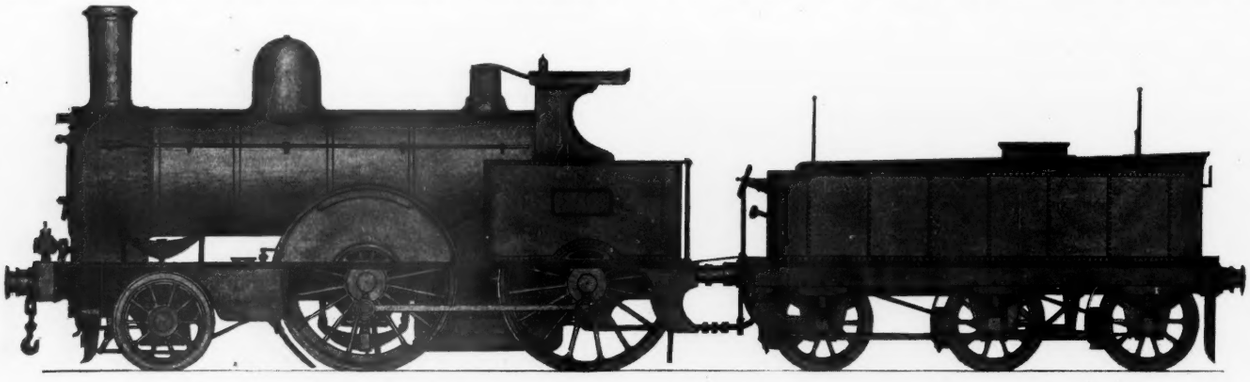
When it became necessary to apply the brake steam was admitted to the under side of the piston in the first cylinder and the ensuing upward movement of this piston forced the plunger outward, which in turn forced the water in the train pipes into the brake cylinders and set the brakes. Exhaust-

ing the steam from the under side of the first cylinder restored everything to a normal condition.

The engine handling this train had its four driving wheels controlled by hydraulic cylinders acting on wooden brake-blocks; and the tender was also fitted in the same way, with the addition of equalizing bars to insure perfect and uniform application.

Owing to the parts for this outfit not having reached the Midland Railway a sufficient time before the trial, only eight of the carriages in the train were equipped with it. The rest used hand-brakes.

The third Midland train was equipped throughout with the Westinghouse automatic brake, and it is scarcely necessary to say that it contained all the latest improvements of the device up to that time. Of course the four-way cock allowing



London & North-Western Locomotive.

the brake to be worked either automatic or straight air, or to be entirely cut out of the vehicle to which it was attached, was on each unit of this train. The original air signal of the Westinghouse company also formed one of the important features. A signal cord extended through all the compartments of each carriage to a valve on the outside, similar to our conductor's signal valve of to-day, but this valve was connected to the train brake-pipe, which did double duty both for brakes or signal. The whistle was attached to a pipe carried from a cap over the leakage valve of the tender and was placed close to the driver. The port in the signal valve was made sufficiently small to enable the air to escape slowly when a signal was given and thus prevent making an application of the brakes, as any air which entered the brake cylinders would escape through the leakage valves. A small cylinder was placed on one end of each carriage in connection with the signaling device; when a signal was given, the cylinder moved two small semaphores, one on each side, to a position beyond the outside of the carriage, and thus enabled the guard or the driver to see from which carriage the signal came.

The engine drawing this train was quite similar to the two furnished with the other trains tested by the Midland Company, but it had the Westinghouse driver brake of that period between the drivers, and the six-wheel tender was supplied with both the automatic and hand-brakes.

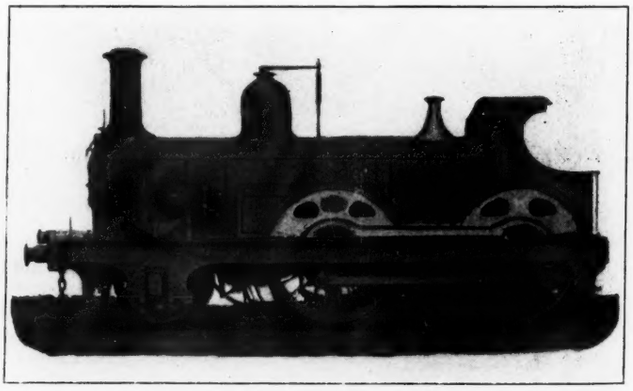
The North-Eastern Railway furnished an engine which was used on two of the trains in part of the trials. It was equipped with the Smith vacuum brake, having the rather peculiar arrangement of six collapsible rubber cylinders on the tender. These cylinders not only applied the brakes on the wheels of the tender, but also operated a chain brake on the four coupled driving wheels of the engine.

The tests began with brakes operated by hand from the vans and tenders only, five trains participating. After having a start of three miles to get up speed, the fireman applied the tender brake as post XXIV was passed, whereupon the driver sounded the whistle to notify the guards, and another man on the engine displayed a flag to call the attention of the observers in the guard vans.

The results in the order of succession were: First, a good stop by the L. & N. W. train under rather unfavorable conditions; after this came a much inferior stop by the Caledonian train. After the Caledonian, the L., B. & S. C. train required 500 ft. more than its predecessor to come to a stop. Those handling it attributed the trouble to imperfect fitting of the cast-iron brake-shoes. The Great Northern train, with Smith's vacuum brake, made a much better stop under the disadvantage of wooden brake-blocks and a rain shower. This was the heaviest train of all taking part in all tests. The last was the Midland train with Clark's hydraulic brake, which made a fair stop on wet rails, ranking third in distance covered after application of brakes.

The second series of tests was with trains stopped by tender and van brakes, and with the continuous brakes applied by the guards on signals given as before. All the trains were tested in this manner. The distance run after application ranged from 1,020 ft., at a speed of 56 miles per hour, to 2,200 ft., at a speed of 54½ miles per hour. This longest distance was with the L., B. & S. C. train, and was found to be owing to a defective ejector. The brake cylinders of the Caledonian train leaked so much air at their stuffing-boxes as to seriously impair their efficiency; the Great Northern train failed to attain sufficient speed on account of imperfect releasing of brake-blocks; while the Midland engine, with the Barker hydraulic brake train, started out with a very low supply of water in the tender, and this becoming highly heated by the water returned to it from the accumulator, the injectors refused to work and the supply of water in the boiler soon dropped to a danger point, which necessitated extinguishing the fire. This was done by the rather singular method of shoveling ballast into it.

The Midland trains with Clark's hydraulic and the Westinghouse automatic brakes, together with L. & Y. (Fay brake), all made good stops, the Westinghouse automatic leading.



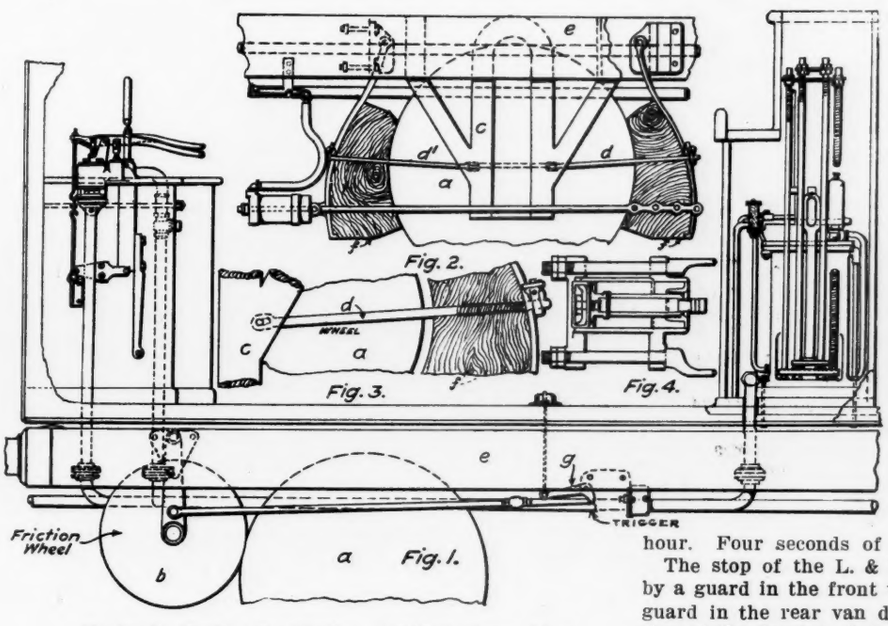
Midland Railway Locomotive.

Using Westinghouse Automatic Brake at the trials, June 9-16, 1875.

The application of engine, tender and continuous brakes without a sanded rail, formed the features of the third tests. After the signals at post XXIV were given the drivers immediately set the continuous brakes where provision was made for them to do so, and where this was not the case the guards performed that duty. The Caledonian (Steel & McInnes), and the L., B. & S. C. (Westinghouse vacuum) trains both made rather poor stops, partly on account of a heavy downpour of rain, and in the case of the latter train because the supply of steam to the ejector, and to the steam cylinder of the engine-brake, was obtained from a single boiler mounting; and

thus the cylinder received little or no steam and failed to apply its brake. The Barker, the Clark & Webb and the Smith vacuum brakes all made poor stops, but very good ones were registered to the Fay, the Clark's hydraulic, and the Westinghouse automatic, the latter leading all in a stop of 913 ft. in 19 seconds from a speed of 52 miles per hour. The Great Northern train was drawn by the North-Eastern engine.

Fourthly came a test with the addition of a reversed engine



Barker's Hydraulic Brake at Work from Van.

in cases where driver brakes were not attached. Sand was used on the rails in these trials. The Caledonian again made no record out of the ordinary, and the L., B. & S. C. was likewise poor. Most of the participants were of the opinion that the brakes on the last section of the L. & Y. were set prematurely. A very good stop was made by the L. & N. W. train with the Clark & Webb brake, but the best of the series was that of the Midland train with the Westinghouse automatic, which came to a full stop in 840 ft. in 18 seconds from the time the signal was given, while running at a speed of 52 miles per hour; and so smoothly was this stop effected that two members of the Royal Commission were not awakened from a nap in which they were indulging at the time in one of the compartments, notwithstanding the fact that the driver had had no previous experience in handling this type of brake until taking charge of the experimental train.

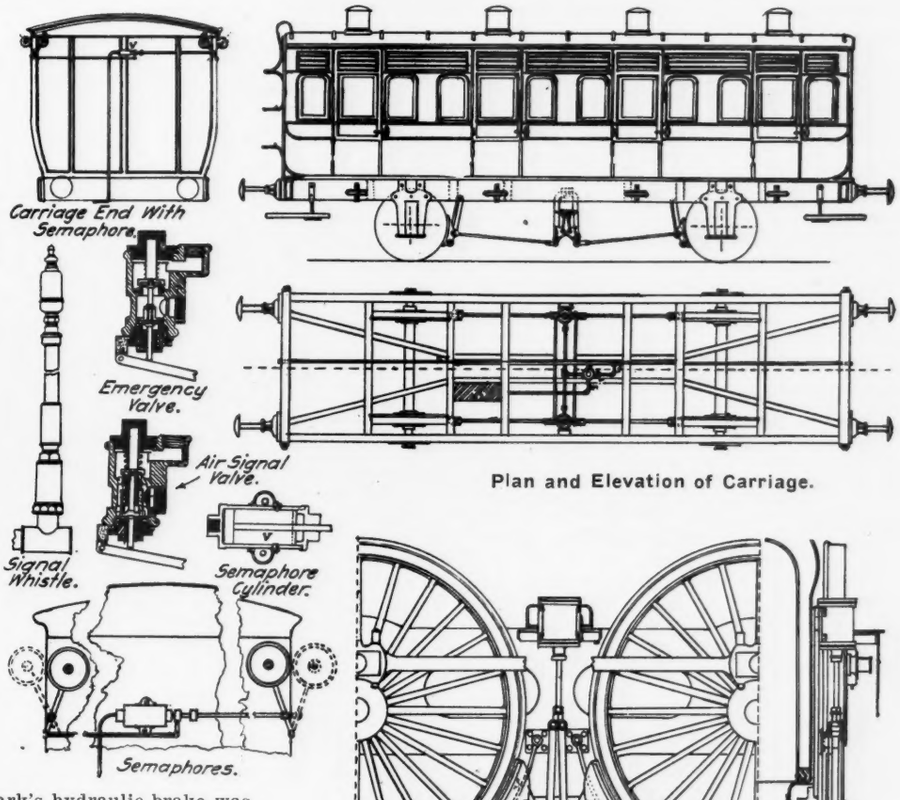
The Great Northern train made a fair stop with the Smith vacuum brake. Barker's hydraulic brake stopped its train with a somewhat better showing than the Steel & McInnes on the Caledonian train. Clark's hydraulic brake was not tried.

The fifth trial consisted in an application of brakes by the engine driver after he was notified of a signal given to the rear guard, or from an intermediate portion of the train. This trial was based, as will be evident, on a condition coming under notice of either the guard or some one on the train. On the L. & N. W. train the driver reversed his engine and then admitted some steam to the cylinders, at the same time setting the continuous brakes by means of the communicating cord, while the fireman applied the tender brake and fed the sand-pipes. In the face of all the time required to manage this combination a very good stop was made.

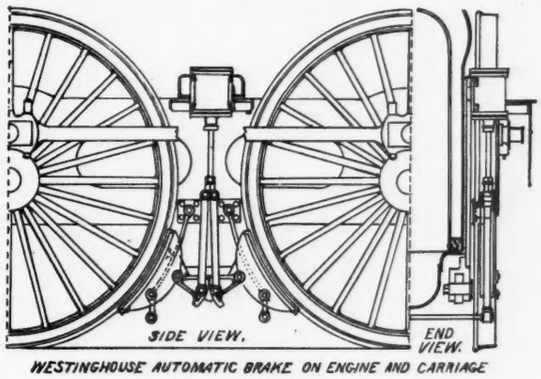
The brakes on the Caledonian train were applied at the given signal by a guard in the fifth vehicle from the engine by use of the communicating cord. This guard at the same time sounded a whistle on the top of the van as a signal to the driver, who at once shut off steam and reversed his engine, while the fireman set the tender brakes, and the guards in the rear vans applied their hand-brakes, all of which brought about a very good stop.

On the L., B. & S. C. train with the Westinghouse vacuum brake the signal was communicated from the fourth carriage to both guards by electric wires, and the front guard in the same way set a bell ringing close to the driver's ear. The latter then applied the steam brake to the driving wheels, and the continuous brake to the carriages and vans, while the fireman sanded the rails and set the tender brake. This stop was made in 1,517 ft. in 32 seconds from a speed of 49½ miles per hour. Four seconds of the 32 were consumed in signaling.

The stop of the L. & Y. train with Fay's brake was made by a guard in the front van applying his brakes first, and the guard in the rear van did likewise after he felt the application of the front brakes. Then the driver shut off steam and



Plan and Elevation of Carriage.



WESTINGHOUSE AUTOMATIC BRAKE ON ENGINE AND CARRIAGE IN TRIALS OF 1875.

Westinghouse Automatic Brake.

the fireman applied the tender brake. The stop in this case was also satisfactory.

Clark's hydraulic brake was set by the driver on a signal given to him by the cord from one of the carriages. He also closed his regulator (throttle), and the fireman worked the tender brake.

The signal for setting the Westinghouse automatic brake was given the driver from the carriage next to the rear van, the working of the signal mechanism at the same time beginning the application of the brakes. As soon as this signal was given the driver shut off steam and applied his brakes, stopping in 14 seconds from a speed of 49½ miles per hour, and within a distance of 1,082 ft.

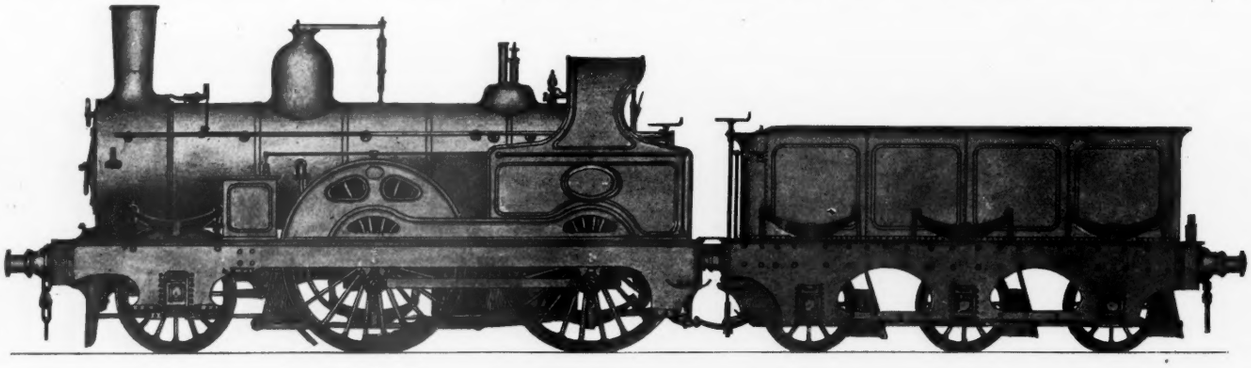
On account of a poorly adjusted cord, the Smith vacuum on the Great Northern train was given a second trial.

Barker's hydraulic brake was not tried.

The sixth test was at a signal given from the rear of the train, after which the driver shut off steam, but neither reversed the engine nor applied any brakes, these all being operated from the rear.

The London & North-Western crew made a good stop, using the communicating cord which on that train passed along the outside of the vehicles, being supported by the handles of the carriage doors.

Two tests of the Westinghouse automatic brake were made at this time: one with the brakes of the engine and tender



North-Eastern Locomotive.

cut out, and the other with these brakes used in connection with those of the train. In both tests the stops were fine.

The Lancashire & Yorkshire guard in the first section of that train applied his brakes as soon as he felt that the guard at the rear had set those under his control and made a creditable stop. The train was drawn in this test by the North-Eastern engine.

The Caledonian train also came in with a good stop, but this was attributed in part to the driver shutting off steam before the signal was given through fear of a "breakaway" from the strain of a rear application.

The Smith vacuum on the Great Northern train was likewise applied first from the rear, but the exhauster in the front van was used in connection.

The seventh test was only taken by the trains of the L. & N. W. and that of the Midland with the Westinghouse automatic brake. The principal feature of this test was cutting out the use of all continuous brakes on the vehicles and depending upon those of the engine and tender to stop the entire train, using the engine reversed in cases where it was not supplied with brakes on the driving wheels.

The Midland train was brought to a stop in 1,021 ft. less distance than its competitor, and in 25 seconds less time.

The eighth test, which consisted of breaking the trains apart while running by means of slip couplings in order to observe the working of the automatic brakes under such conditions, appealed especially to the English railroad officials, as numerous serious accidents had occurred from "breakaways." The only trains really adapted to such a test were the Caledonian, the Great Northern and the Midland train with the Westinghouse automatic brake. Fay's brake was, however, allowed to participate, as its designer claimed that its mode of construction was capable of holding the carriages together in case a coupling broke.

The Westinghouse automatic again made a splendid stop, and both the Caledonian and the L. B. & S. C. trains did very well, but the Great Northern train made so poor a showing that it was eventually necessary to stop it with the hand-brakes.

All the preceding experiments very clearly showed what could be expected of the different types of brakes under various conditions or emergencies which were very likely to be met with in regular service on the lines, and the remaining four tests, as will be seen, were of a somewhat different character.

The ninth test was made to ascertain the relative promptness of action of each type of brake. It was at first intended to make two trials of each train, one at a speed of 40 miles an hour and one at 60 miles an hour, but various unexpected conditions prevented this idea from being carried out and the tests were therefore made with the trains at rest.

The Great Northern and the Brighton outfits released rather sluggishly, but the application was practically instantaneous with each.

The application of the Fay brake was speedy, and the Steel & McInnes brake also made a quick application, but a rather irregular release.

The tenth test was to ascertain the relative retarding forces offered by skidded wheels, or wheels in which the momentum was checked close to the skidding point, and was completed in two runs with trains composed of six brake vans, four of which had slide brakes and wooden shoes while two had shoes of cast-iron. These two were taken from the Midland train with the Westinghouse automatic brake. A guard rode in each van, and these men applied the brakes at the proper time after the required speed was obtained and the vans were disconnected from the engine by the use of a slip coupling. The first trial was with the unskidded wheels, and the second with all skidded. The result was in favor of the skidded wheels. An observer in one of the vans communicated the signals to the guards and noted the performances of men and trains.

The eleventh problem attacked was the frictional resistance of engines and tenders, the London & North-Western and the North-Eastern engines representing the four-coupled class of engines, and the Great Northern the single driver type. Three tips were made; the first with steam shut off when the desired speed was attained, and the engine and train were permitted to come to rest without braking; the second with the use of the train brakes after steam was shut off, and the third with the tender brake set and the engine reversed with steam admitted to the cylinders, except on the N.-E. engine, whose driver applied the Smith vacuum driver-brake with which it was fitted.

The twelfth and last of the tests consisted in pushing each train by an engine from the rear until the required speed was obtained, when the engine stopped and the train was allowed to drift until it stopped of its own frictional resistance. The results were affected in the case of one train by a strong wind blowing against it at an angle of 45 deg., and another by a slight contact of some of its brake-blocks.

The data gained from all of the preceding tests showed among other things that while the two mechanical types of brakes already described were capable of making very satisfactory stops, the first cost of the Fay was one obstacle to its introduction in regular service, but a greater obstacle ap-

peared in its somewhat complicated coupling which would retard speedy making up or unmaking trains. The latter objection also applied to the Clark & Webb brake to some extent, and this brake was further handicapped by the necessity of having trains equipped with it divided into sections of brake power in order to obtain the greatest efficiency, while the dependence upon a cord to effect its application in case of a breakaway was another weak feature. The Fay was similarly deficient in means of application under the same condition. The Clark & Webb brake will be recognized by the older railroad men as very closely allied to the Loughridge continuous chain-brake which was used for several years on a number of leading American railroads previous to the introduction of the Westinghouse air-brake in 1869. With the Loughridge, the braking was done from the engine alone by a grooved friction wheel on the end of a shaft around which the brake chain was wound, and which was brought into contact, when desired, with the flange of the rear driving wheel by means of suitable levers extending upward through the foot-plate to the engineman. It could not be operated from any other part of the train, and was not sufficiently effective on more than four or five cars from the engine—the same trouble which led the designers of the English form to use it on their trains in sections.

The hydraulic brakes both showed promptness in action, but were not looked upon with favor on account of the great danger of freezing up in wintry weather. On the Great Eastern Railway, where one of these types was used at the time, the freezing up had been overcome by using salt water, a special tank for a supply having been placed in each guard van, but even then the objection referred to in connection with one of the mechanical brakes remained, viz., that neither could be applied from the rear of the train except by the unreliable cord.

Of the vacuum brakes, the Westinghouse type was looked upon with greater favor by most of the railroad people on account of the evident superiority of its cast-iron brake cylinders over the more easily damaged rubber bags of its competitor; but like all of the preceding brakes, these also were lacking in automatic features, which appealed so strongly to the officials as a necessity of any continuous brake.

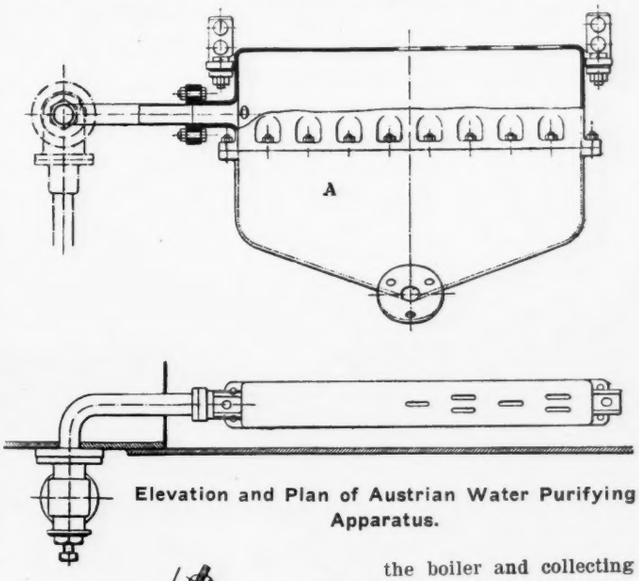
Coming now to the types using the direct application of compressed air to set the brakes, the Steel & McInnes, although strictly automatic, appeared to better advantage in theory, or on the drafting board, than in actual service; and the great, and apparently unremediable, leaking at the glands of the brake cylinders, together with too small a range in application, were decidedly against its permanent introduction on the lines. Of the other air-brake, *Engineering* of June 25, 1875, in closing a very thorough and elaborate series of articles describing these trials, and from which many of the facts of this article have been obtained and condensed, says: "Lastly we come to the Westinghouse automatic arrangement, and this we think we may safely say is shown by the recent trials to possess all the requisites of a thoroughly efficient continuous brake. This brake proved more prompt and powerful in its action than any of its competitors, while it acted perfectly on the train being parted by a slip coupling, and it is moreover capable of being operated from the rear or any other portion of the train at pleasure. With no brake on the ground could the breaking up and remaking of a train be more readily performed, while a spare length of pipe is all that is necessary to enable the brake to be led past a carriage that is not fitted with the apparatus. We ourselves believe it to be a mistake to apply a powerful brake to act upon blocks fitted to one side of a wheel only, and we believe that had the Midland train been fitted with double blocks the stops would have been still more prompt. However this may be, the performances as they stand were far beyond those of any other brake, as a reference to our table will show. As regards durability and general reliability in every-day practice also, it must be remembered that no brake sent to the trials has been so thoroughly tested as the Westinghouse, and this is a fact which it is well to bear in mind."

Surely a remarkable tribute for that day to an American invention, in the face of such strong English competition.

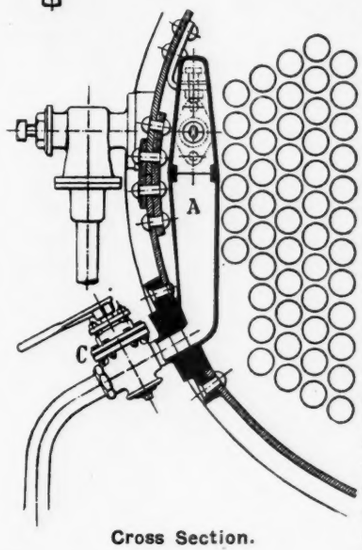
As far as the writer can determine definitely from his available data, none of the lines represented in these trials now use any of the types of brakes with which their trains were equipped at that time, except probably the Great Northern and the North-Eastern. The later photographs of engines of the Caledonian and of the London, Brighton & South Coast show Westinghouse air-pumps on the engines; the Midland in its published folders states that its passenger trains are equipped with "an automatic brake"; a description published a few years ago of an over-turn in Preston yard of a London & North-Western express train mentions that vacuum brakes were used on these trains south of Carlisle; and drawings of Lancashire & Yorkshire engines built in recent years show them fitted with vacuum brakes.

WATER PURIFYING APPARATUS FOR LOCOMOTIVES.

Experiments are now being made on several locomotives of the Austrian State Railroad with a special arrangement for water purification, the principle upon which it acts being that of causing the deposit to be made as the water enters



Elevation and Plan of Austrian Water Purifying Apparatus.



Cross Section.

the boiler and collecting it in a suitable receptacle. It has been ascertained that the encrusting deposits are formed as the water comes in, and the precipitation of the mud further shows that, as the water leaves the injector pipe and suddenly loses its velocity, and is as suddenly raised to a higher temperature through 180 deg. or more, the outlet from the check is a favorable place to collect the solids held in suspension. The Austrian apparatus consists of two cast iron reservoirs made in two parts, and so placed on either side of the nest of tubes as to be submerged. About once every 100 miles the blow-off cocks, C, are opened and the injectors started to maintain a high pressure in the reservoir and drive out the deposits. The results thus far obtained have been satisfactory. The character of the feed-water used is such that in order to avoid trouble it has formerly been necessary to wash out the boilers every eight days, whereas in the locomotives fitted with this apparatus they may be run for fifteen days without washing. Furthermore, under these conditions the deposits left are no longer hard and adherent, but a fine sand that is readily removed by washing.

An examination of the deposits shows that the apparatus has not only caused the precipitation of the solid matter held

in suspension, but has also affected that of the soluble salts that form scale, that is to say, the carbonate, sulphate, and a salt which the Austrian engineers call the magnesiate of lime.

A chemical analysis shows that these three salts enter into the deposits in the same proportions that they occur in the water.

An important point in connection with the precipitation of the magnesiate of lime is that it has not yet been possible to eliminate it by any system of water purification before entering the boiler; and it is known that it is to this salt that the carbonate and sulphate of lime owe their hard and adhesive qualities.—*Revue Generale des Chemins de fer.*

THE LOCOMOTIVES OF THE EASTERN RAILWAY OF FRANCE.

BY CHAS. S. LAKE.

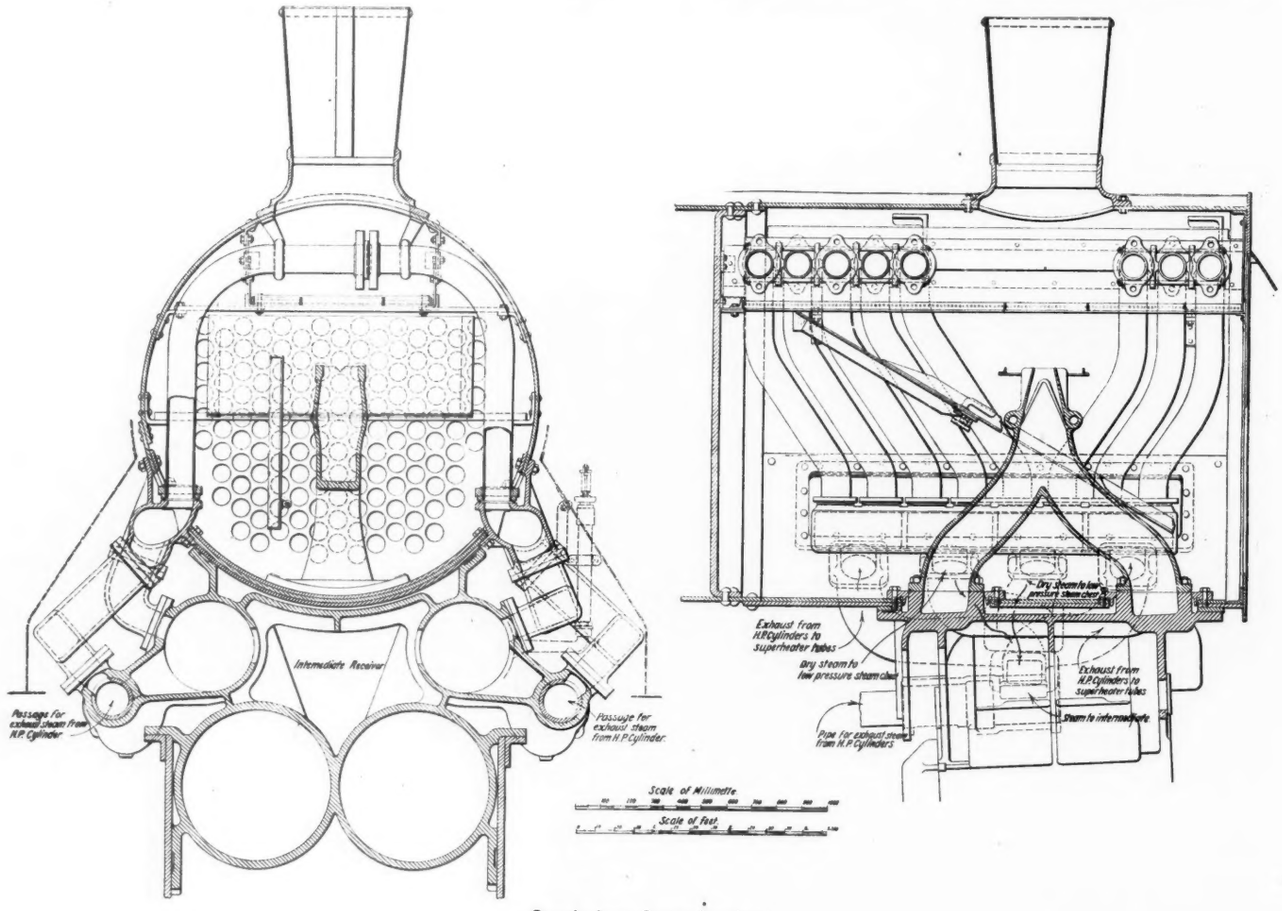
II.

These express locomotives, as indeed all engines of the Eastern Railway, are fitted with the Flaman speed indicator and recorder. This highly ingenious instrument is being widely adopted in France, where a ministerial order has been issued to the effect that all locomotives used in passenger service must be provided with tachographs. A number of Eastern Railway compound locomotives have recently been equipped with the special type of receiver shown in the accompanying drawing. The receiver consists of several steam pipes of large diameter ending in two collectors placed one on each side of the smokebox outside. The arrangement effects what amounts to the superheating of the low-pressure steam 59 degrees F., which, it is found, results in a fuel economy of 4 per cent. The steam on exhausting from the high-pressure cylinders enters the collecting chambers, and thence traverses the pipes in the interior of the smokebox before reaching the low-pressure cylinders in a superheated condition. Although this system is only suitable for low-pressure steam, it is interesting as being the first application, on anything like a large scale, of the principle of superheating in France. The drawing illustrates the arrangement as applied to the latest 4-6-0 type express locomotives, but it is also being applied to the heavy 2-8-0 type goods and other engines.

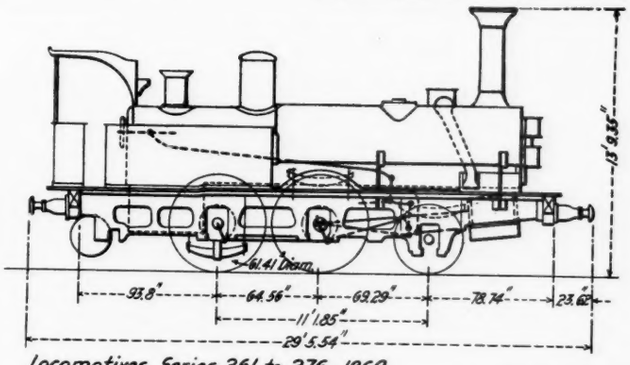
One of the powerful 14-wheeled tank locomotives (class 3900) designed by Mr. Salomon for dealing with heavy suburban and main line shorter distance traffic of a mixed character is illustrated herewith. These engines are four-cylinder compounds with boilers of practically the same dimensions as those fitted to the 4-6-0 type 5 ft. 8½ in. locomotives. The presence of the four-wheeled bogies at each end imparts flexibility to the long wheel base, and the six coupled wheels of small diameter operated by four powerful cylinders renders the design an exceedingly powerful one. Each of the fourteen wheels is acted on by Westinghouse brake mechanism. The engines, with their 47 tons of adhesion load, are splendid weight pullers. The run to Thierry, 95 kilometers (59 miles), is performed by them with heavy trains in 1 hr. 57 min., including stops at 18 intermediate stations. This is 30 minutes less than the time required for covering the same distance by the older tank engines.

The volume of goods traffic dealt with on the Eastern Railway is heavy, and the locomotives employed for the work are of the most powerful description. The latest design (class 4000) has the 2-8-0 wheel arrangement, and is a compound. The four cylinders are placed in transverse alinement below the smokebox, with the high-pressure cylinders inside the frames driving the crank axle of the second pair of coupled wheels and the low-pressure cylinders outside driving the third pair. A separate Walschaerts valve gear is employed for each of the four slide valves, the latter being of the piston type throughout. These locomotives are equipped with the Westinghouse brake and they haul loads well over 1,000 tons with ease.

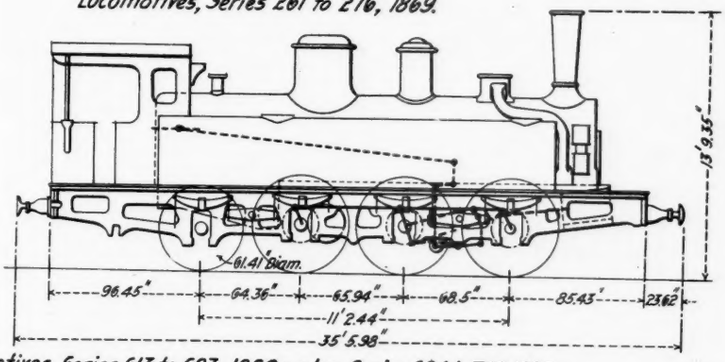
Lately, some six wheel coupled simple goods engines of an


Intermediate Receiver
Passage for exhaust steam from H.P. Cylinder
Passage for exhaust steam from H.P. Cylinder
Exhaust from H.P. Cylinders to superheater tubes
Dry steam to low pressure steam chest
Exhaust from H.P. Cylinders to superheater tubes
Steam to intermediate
Pipe for exhaust steam from H.P. Cylinders
Scale of Millimetre
Scale of Feet

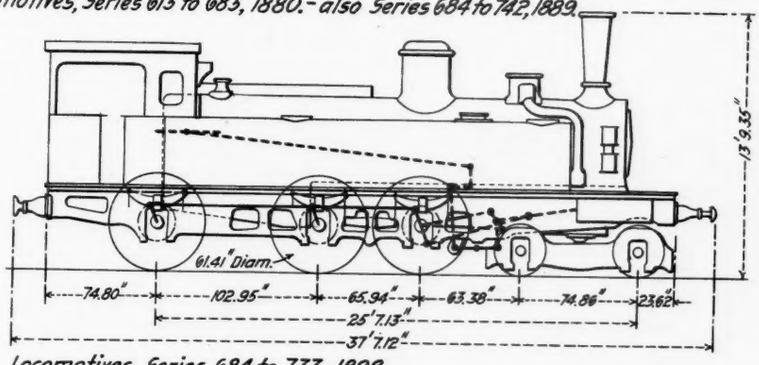
Smokebox Superheater.



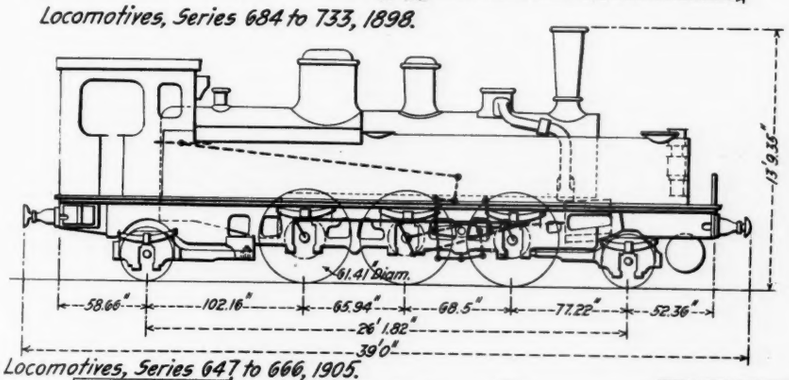
Locomotives, Series 261 to 276, 1869.



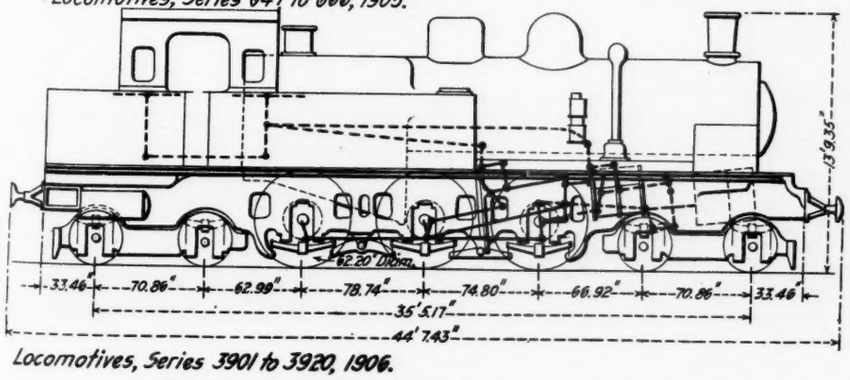
Locomotives, Series 613 to 683, 1880.- also Series 684 to 742, 1889.



Locomotives, Series 684 to 733, 1898.



Locomotives, Series 647 to 666, 1905.



Locomotives, Series 3901 to 3920, 1906.

Development of Tank Locomotive; Eastern of France.

older pattern have been converted into two-cylinder compounds, class 3000, and brought up to date, by providing them with larger boilers and introducing a pony truck at the leading end, thus making them 2-6-0 type engines. The engines are now able to haul trains of 600 to 700 tons behind the tender on most sections of the railroad.

The tenders fitted to recent Eastern Railway locomotives run on six wheels 4 ft. 8 in. in diameter, with a wheel base of 14 ft. 9 in. The latest tenders carry 6 tons of coal and 4,880 gallons of water. The weight, loaded, is 48 tons.

Examination of the working drawings of the Eastern Railway's engines and of the locomotives themselves shows that the designs have been worked out with the greatest amount of care and skill, and the performance of the engines in hauling some of the heaviest express trains in Europe over one of the most difficult tracks in France deserves high praise.

As mechanical engineering representative of the *Railway Gazette*, the writer was recently afforded, by the courtesy of Mr. Salomon, facilities for observing under privileged conditions, the daily work of the various types of locomotives, and in every case the performances were such as to fully justify the selection of the type of engine and its proportions for the duty required. On several occasions time was made up with trains of maximum weight, and the power of acceleration exhibited by the larger 4-6-0 type express locomotives, as well as the manner in which they negotiated the heavy gradients, especially those between Chaumont and Belfort, was, to say the least, remarkable. The large diameter of their coupled wheels enables them to equal the fastest performances of the four coupled engines on the level and down hill, while their hauling powers are, of course, superior. In every sense the type appears to be one of the most successful yet put to work on a European main line. The greatest assistance, in judging of the work done by the engines, is rendered by the Flaman speed indicator, which makes it possible to ascertain, both at the time and subsequently, precisely at what speed the engine was traveling at any given moment. Without such an instrument it is impossible to altogether exclude the element of doubt, even with the most careful stop-watch methods.

The principal, and also the most difficult, section of the Eastern Railway is that which lies between Paris and Belfort, 275 miles, forming part of the through route between the French capital and Milan, via Basle and the Swiss Federated Railroads. The gradients encountered at various stages between the points named are, as will be seen from the accompanying profile of the line, of a difficult character, the steepest ranging from 1 in 165 to 1 in 125, while there are many miles of lower, but still heavy gradients which have to be traversed at high average speeds.

The more important express trains usually comprise eleven cars, including one dining car and two luggage vans,

weighing, on the average, 300 tons, exclusive of engine and tender. Below is given the average loading of the three principal express trains in each direction on the Paris-Belfort and on the Paris-Avricourt sections of the railroad:

Paris-Belfort Section.

Train	31	From Paris to Montreux-Vieux.*	320	tons.
"	37	" " to Belfort	300	"
"	57	" " to Montreux-Vieux	260	"
"	30	" Montreux-Vieux to Paris	320	"
"	32	" " " "	320	"
"	58	" " " "	320	"

Paris-Avricourt Section.

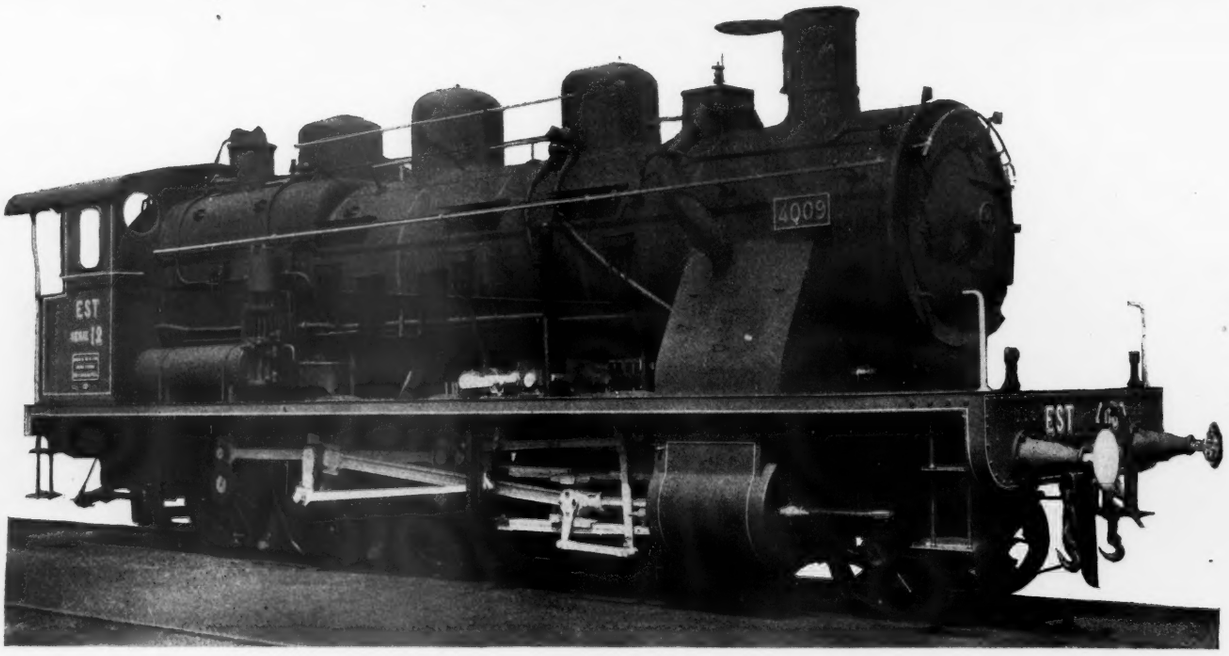
Train	31	From Paris to Avricourt	300	tons.
"	33	" " "	350	"
"	35	" " "	290	"
"	28	" Avricourt to Paris	310	"
"	30	" " "	250	"
"	34	" " "	340	"

*Alsace-Lorraine frontier station.

From these figures it is seen that the maximum loading on the Paris-Belfort section is 320 tons, while on the Paris-Avricourt section, where the gradients are generally easier, it amounts to 340 tons.

Train 31 leaves Paris for Belfort and beyond at 8.45 a.m., It is due at Belfort at 2.56 p.m., with stops at Troyes, 104 miles; Chaumont, 164 miles; Langres-Marne, 185 miles, and Vesoul, 238 miles. The writer's experience with this train on two separate occasions was most satisfactory. On each trip a slightly late start was made from the Gare de l'Est, Paris, owing to delay in the delivery of the mail bags, but the lost time was easily made up by the engine before reaching Troyes, where the first stop is made. The weight of train was given officially as 320 tons on both journeys, and the engines were of the 6 ft. 10½ in., six-coupled type, viz.: No. 3,111 from Paris to Chaumont, and No. 3,114 from the latter place to Belfort, on the first trip, and Nos. 3,116 and 3,118, over the same sections, respectively, on the second trip. Despite a heavy, permanent way slack extending for over a mile, near

Heavy Four-Cylinder Tank Locomotive, Built in 1906.



Four-Cylinder Compound Consolidation, with Smokebox Superheater.

Nogent sur-Seine, the train arrived punctually at Troyes, after some very fast running necessitated by the enforced slack referred to. On each occasion, the Chaumont engine showed to great advantage when running over the difficult section between that place and Belfort, the grade climbing being excellently performed and the speed on the declivities very high indeed.

The Paris-Troyes run of 104 miles was performed, on the writer's second trip, by engine No. 3,116 in exactly two hours, giving an average speed of 52 miles an hour. The true average, after deducting the heavy slack at Nogent, would, however, be nearer 54 than 52 miles, for the covering of the 1¼ miles of line under repair occupied nearly six minutes, and there were other, though much slighter, reductions of speed at both Gretz and Romilly. The complete journey of 275 miles from Paris to Belfort was covered on the first occasion in 5 hrs. 56 min. actual running time, an average speed of practically 47 miles an hour, which, considering the very heavy and continuous gradients and the heavy train load, was a satisfactory performance in every respect. On the second occasion the run over the same distance occupied two minutes more time. The 10.46 p.m. international sleeping car train from Paris does the Paris-Belfort run, with stops at Troyes, Chaumont and Vesoul, which consume, in all, 15 minutes, in 5 hrs. 45 min. gross, or 5 hrs. 30 min. net, running time. The loading of this train is usually lighter than that of the morning express, and the writer found that the 3111 class locomotives, Nos. 3,112 and 3,116, improved on schedule time by 2 minutes on the Paris-Chaumont run, where the first of these engines was employed, and by 1 minute on the Chaumont-Belfort run, when No. 3,116 was hauling the train.

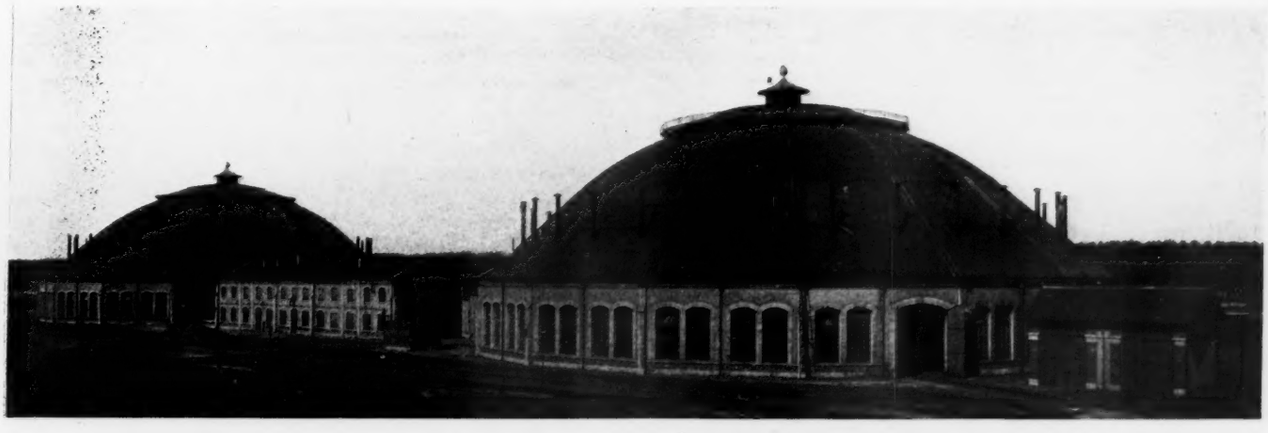
Equally satisfactory experiences were met with on the Paris-Avricourt line, especially in one case when locomotive No. 3,020 passed Epernay, 87.6 miles out, with the 9.00 a.m. express from Paris, weighing 300 tons behind the tender, in 1 hr. 31 min. The return journeys to Paris were in all cases examples of excellent locomotive work.

Two-Cylinder Compound Mogul, Converted from Six-Wheel Coupled Simple Freight Engine.

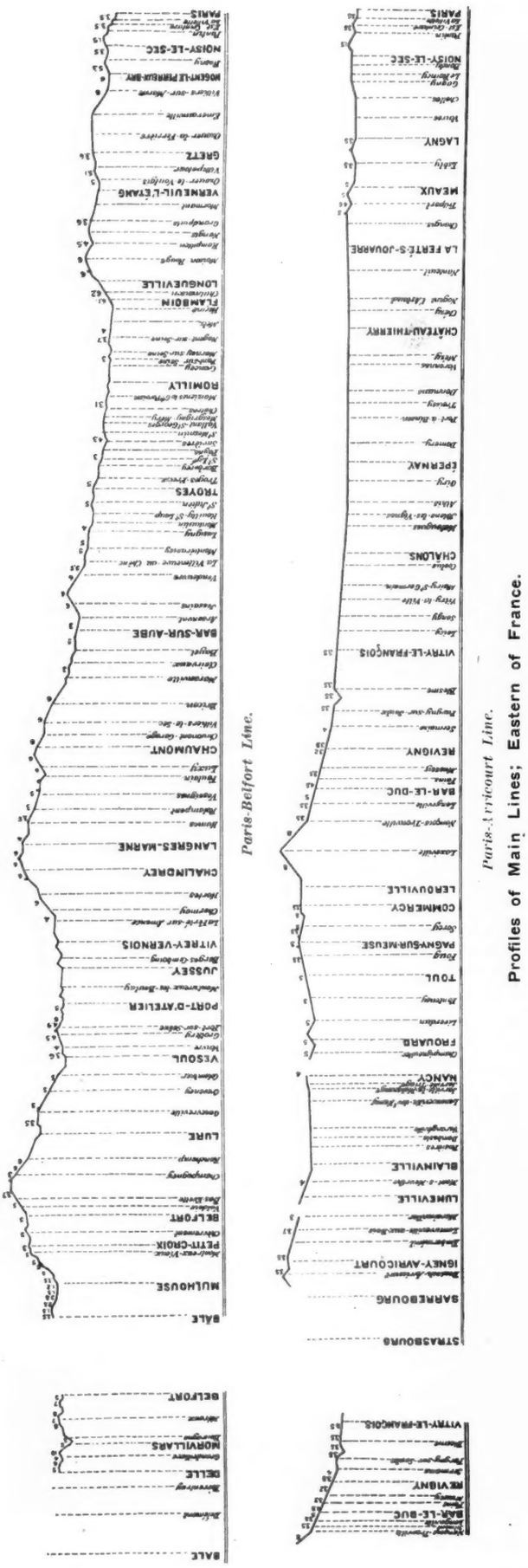
The locomotives of the 3100 class consume, on the average, when hauling the trains referred to above, 43.57 lbs. of fuel per mile, and the water consumption, including the water converted into steam, that used for spraying the coal and other miscellaneous losses, amounts to about 40 gallons per mile.

The steam pressure on the Paris-Belfort run is practically constant at 189 lbs.; it is never allowed to fall below that figure. The registered pressure of the boilers is 220 lbs. per sq. in. The coal used is mostly that known as demimaigre, and is, for the greater part, fine screened coal from the mines of Bascoup and Dourges. With proper firing this fuel produces eight times its weight in steam.

The Paris locomotive terminals of the Eastern Railway,



New Roundhouses at La Villette, Paris.



comprising the two sheds at La Villette and Noisy, can accommodate 169 locomotives, as follows: 42 express locomotives, 72 passenger suburban tank engines, 37 goods locomotives, and 18 shunting engines. One of the accompanying illustrations shows these terminals.

The first-class carriage in the express trains of the Eastern Railway are of the corridor vestibuled type on four-wheeled bogies. They are most comfortable, being adequately upholstered and artistically finished. The heating of the cars is by steam mixed with compressed air on the system originated by Mon. Lancrenon, assistant chief mechanical engineer of the Eastern Railway. Auer gas lighting is employed; the Eastern Railway was the first in the world to adopt this method of lighting in a really practical manner and to apply it generally. There are no side doors, the exits being one at each end of the vehicle. Every provision is made for converting the ordinary day compartment into a sleeping compartment at night time. All notices are printed in French, English and German.

The writer's thanks are due in the first place to Mr. Salomon, for permission to investigate the working of the locomotives designed by him, and secondly to Mr. Flaman and Mr. Birckel, chief draftsman, for valued assistance in the preparation of the diagrams and other detailed matter accompanying the foregoing article.

Principal Dimensions of Modern Locomotives of the Eastern Railway of France.

	4-6-0 3111.	4-6-0 3581.	4-6-4 Tank.	2-8-0 Goods.	2-6-0 Goods.	4-4-0 2409.
Cylinders, diameter	H.p. (2) $14^{3}/_{16}$	H.p. (2) 13¾	H.p. (2) 13¾	H.p. (2) $15^{9}/_{16}$	H.p. (1) 16½	H.p. (2) 13¾
	L.p. (2) 23¼	L.p. (2) 21⅝	L.p. (2) 21⅝	L.p. (2) $24^{1}/_{16}$	L.p. (1) 24½	L.p. (2) 21¾
Stroke of pistons, in.	26¾	25¼	25¼	25⅝	26	H.p. 25¼ L.p. 26
	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.	Ft. In.
Bogie wheels, diam	3 0¼	3 0¼	2 9½	2 9¾	3 0¼	3 5½
Coupled wheels, diam	6 10¼	5 8½	5 2¼	4 7½	4 7⅞	6 8¾
Wheelbase, rigid	16 3	13 5¼	12 9½	16 1	11 7¾	10 0
Do., total of engine	29 2	26 9	35 6	23 1	19 8¼	23 9½
Boiler, diameter	5 1	4 10	4 10	5 0	4 9½	4 9½
Do., length of tubes	14 5	13 9½	13 9½	14 1½	13 9½	12 5½
Heating surface:	Sq.ft.	Sq.ft.	Sq.ft.	Sq.ft.	Sq.ft.	Sq.ft.
Tubes	2,353.1	2,073.5	1,449.0	2,332.5	1,442.0	2,098.0
Firebox	174.5	135.5	150.0	170.0	113.8	135.6
Total	2,527.6	2,209.0	1,599.0	2,502.5	1,555.8	2,233.6
Grate area	33.0	27.0	26.0	28.5	22.1	27.1
Boiler, steam press., lbs.	220	220	220	220	220	220
W't on cpld whls, tons	53½	48¼	46¼	64¼	39½	33½
Eng., wrkg order, tns	78½	68½	88¾	71¾	51¾	58½
Tractive effort, lbs.	19,174	19,150	21,073	30,903	16,491	16,716

	4-6-0 3111.	4-6-0 3581.	4-6-4 Tank.	2-8-0 Goods.	2-6-0 Goods.	4-4-0 2409.
Weight on drivers / Tractive effort	= 6.25	5.64	4.91	4.65	5.36	4.48
Total weight / Tractive effort	= 9.12	8.01	9.43	5.20	7.03	7.84
Trac. eff. x diam. drvrs / Heating surface	= 625.83	593.83	821.63	685.36	592.25	604.32
Heating surface / Grate area	= 76.59	81.81	61.50	87.81	70.39	82.42
Firebox heating surface / Total heating surface	= *6.90	*6.13	*9.38	*6.79	*7.96	*6.07
Weight on drivers / Total heating surface	= 47.41	48.88	64.79	57.51	56.87	33.59
Total weight / Total heating surface	= 69.56	69.46	124.32	64.22	74.58	58.67
Vol. 2-h.p. cyldrs., cu. ft. / Total heating surface	= 4.89	4.34	4.34	5.64	3.07	4.34
Total heating surface / Vol. 2-h.p. cylinders.	= 516.66	508.98	368.43	443.70	506.77	514.65
Grate area / Vol. 2-h.p. cylinders	= 6.74	6.22	5.99	5.00	7.20	6.24
Tube htg surf. equated to firebox heating surface, Vaughan formula	= 620.8	558.9	390.5	622.0	354.8	594.3
Total equated firebox htg. surface / Total heating surface	= 795.3	694.4	540.5	792.0	478.7	729.9
Total heating surface / Total equated htg. surf.	= 3.17	3.18	2.96	3.16	3.22	3.06

*Per cent.

SIX NEW FEDERAL LAWS.

The session of Congress just closed has passed a half-dozen laws which are of interest to railroads generally. The most prominent is that enlarging the liability of common carriers to their employees for damages for personal injury or death. This bill has already been noticed, having been passed April 22, but the full text of the law is now given (see below).

The next law is one requiring that after January 1, 1910, all locomotives used in interstate commerce shall have ash pans which can be cleaned without the necessity of an employee going beneath the engine. The Interstate Commerce Commission is to enforce the law, and the penalty for each violation is $200.

One introduced by Senator Kean, of New Jersey, regulates the transportation of explosives. It forbids the transportation of explosives in interstate or foreign commerce on any vessel or vehicle carrying passengers for hire, with certain exceptions, and empowers the Interstate Commerce Commission to prescribe regulations for the safe transportation of explosives by land. Such regulations must be made within 90 days, and they are to take effect within three months after their publication. This act will have the effect of converting the regulations for the transportation of explosives which have been formulated by the American Railway Association into a federal law, which can be violated only on pain of fine (not exceeding $2,000) or imprisonment (not exceeding 18 months), or by both fine and imprisonment; for the Commission will, without doubt, adopt the Association's rules. The law says that the regulations shall be in accord with the best-known practicable means for securing safety, etc. Transportation of liquid nitroglycerine, fulminate in bulk, dry, and other like explosives is absolutely forbidden. This law repeals a number of obsolete statutes.

Public law No. 95, approved April 13, amends the Interstate Commerce law by the addition of the following proviso to Section 1, Paragraph 4 (enumerating the classes of persons who may be carried free):

"That the term 'employees' as used in this paragraph shall include furloughed, pensioned and superannuated employees, persons who have become disabled or infirm in the service of any such common carrier, and the remains of a person killed in the employment of a carrier and ex-employees traveling for the purpose of entering the service of any such common carrier; and the term 'families' as used in this paragraph shall include the families of those persons named in this proviso, also the families of persons killed while in the service of any such common carrier."

A clause in the sundry civil appropriation bill, while not affecting railroads directly, is of interest to railroad officers in that it enlarges the power of the Interstate Commerce Commission in the matter of investigating railroad appliances. The "Block Signal and Train Control Board," authorized a year ago, and which heretofore has been engaged mainly in the examination of inventions relating to block signaling, may now, under the law as it now stands, extend its inquiries to include any "appliances or systems intended to promote the safety of railway operation"; though the law gives no encouragement except to inventions "which may be furnished in completed shape for inspection and test entirely free of cost to the government."

The sixth and last of the laws referred to, public statute No. 134, deals only with street railways in the District of Columbia, but is of interest as showing the tendency of Congress to enlarge the powers of the Interstate Commerce Commission. The main purpose of this law is to authorize short extensions of certain street railways to the new union station, but it includes a section relating to free transfer tickets, which applies throughout the city, wherein is a provision empowering the Interstate Commerce Commission to prescribe regulations for the dating and punching of such transfers; and another section empowering the Commission to compel obedience to that portion of the law which requires all street railways in the District of Columbia to provide clean and safe cars, efficient power, equipment and service; and to give expeditious passage to all persons without crowding, etc.

A bill which was introduced by Representative Esch, of Wisconsin, empowering the Interstate Commerce Commission to investigate railroad accidents, was passed by the House on May 27, but the Senate did not take it up.

THE LIABILITY LAW.

Be it enacted, etc., That every common carrier by railroad while engaging in commerce between any of the several states or territories, or between any of the states and territories, or between the District of Columbia and any of the states or territories, or between the District of Columbia or any of the states or territories and any foreign nation or nations, shall be liable in damages to any person suffering injury while he is employed by such carrier in such commerce, or, in case of the death of such employee, to his or her personal representative, for the benefit of the surviving widow or husband and children of such employee; and, if none, then of such employee's parents; and, if none, then of the next of kin dependent upon such employee, for such injury or death resulting in whole or in part from the negligence of any of the officers, agents, or employees of such carrier, or by reason of any defect or insufficiency, due to its negligence, in its cars, engines, appliances, machinery, track, roadbed, works, boats, wharves, or other equipment.

Sec. 2. That every common carrier by railroad in the territories, the District of Columbia, the Panama Canal Zone, or other possessions of the United States shall be liable in damages to any person suffering injury while he is employed by such carrier in any of said jurisdictions, or, in case of the death of such employee, to his or her personal representative, for the benefit of the surviving widow or husband and children of such employee; and, if none, then of such employee's parents; and, if none, then of the next of kin dependent upon such employee, for such injury or death resulting in whole or in part from the negligence of any of the officers, agents, or employees of such carrier, or by reason of any defect or insufficiency, due to its negligence, in its cars, engines, appliances, machinery, track, roadbed, works, boats, wharves, or other equipment.

Sec. 3. That in all actions hereafter brought against any such common carrier by railroad under or by virtue of any of the provisions of this act to recover damages for personal injuries to an employee, or where such injuries have resulted in his death, the fact that the employee may have been guilty of contributory negligence shall not bar a recovery, but the damages shall be diminished by the jury in proportion to the amount of negligence attributable to such employee: Provided, That no such employee who may be injured or killed shall be held to have been guilty of contributory negligence in any case where the violation by such common carrier of any statute enacted for the safety of employees contributed to the injury or death of such employee.

Sec. 4. That in any action brought against any common carrier under or by virtue of any of the provisions of this act to recover damages for injuries to, or the death of, any of its employees, such employee shall not be held to have assumed the risks of his employment in any case where the violation by such common carrier of any statute enacted for the safety of employees contributed to the injury or death of such employee.

Sec. 5. That any contract, rule, regulation, or device whatsoever, the purpose or intent of which shall be to enable any common carrier to exempt itself from any liability created by this act, shall to that extent be void: Provided, That in any action brought against any such common carrier under or by virtue of any of the provisions of this act, such common carrier may set off therein any sum it has contributed or paid to any insurance, relief benefit, or indemnity that may have been paid to the injured employee or the person entitled thereto on account of the injury or death for which said action was brought.

Sec. 6. That no action shall be maintained under this act unless commenced within two years from the day the cause of action accrued.

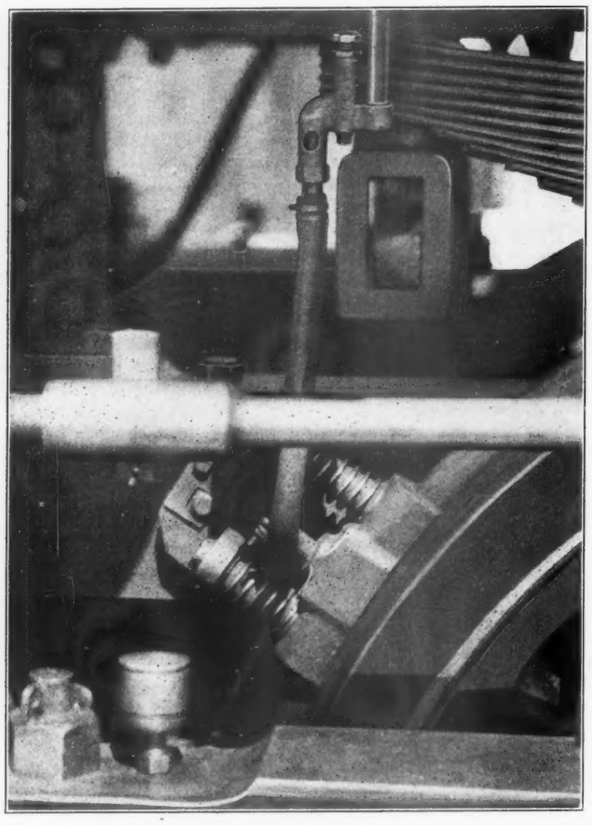
Sec. 7. That the term "common carrier" as used in this act shall include the receiver or receivers or other persons or corporations charged with the duty of the management and operation of the business of a common carrier.

Sec. 8. That nothing in this act shall be held to limit the duty or liability of common carriers or to impair the rights of their employees under any other act or acts of Congress, or to affect the prosecution of any pending proceeding or right of action under the act of Congress entitled "An act relating

to liability of common carriers in the District of Columbia and territories, and to common carriers engaged in commerce between the states and between the states and foreign nations to their employees," approved June 11, 1906.

LUBRICATION OF DRIVING WHEEL FLANGES.

The wear of driving wheel flanges on railroads having frequent sharp curves is a serious item of expense, not only on account of the cost of removing and replacing the wheels and turning the tires and the cost of tire steel, but also on account of the time lost by the locomotive through its not being in regular service. There is also an excessive rail wear due to the friction of the driving wheel flanges on curves, the cost of which it is difficult to estimate. The driving wheel flange lubricator which is here illustrated should, therefore, be of interest to the officers connected with railroads having sharp curves. It has been used on some of the locomotives of the Santa Fe, Prescott & Phoenix Railroad for more than a year with remarkable results in the saving of flange wear and without affecting the adhesion. The wheels on one locomotive have made 40,000 miles without perceptible flange wear, while before the flange oiler was used they required turning after a service of only 20,000 miles.



Driving Wheel Flange Lubricator.

These results were obtained on a section of the line where more than one-half of the length is made up of curves, most of them being of 16 deg. It is found that ordinary lubricating oils cannot be used for this purpose, but California fuel oil appears to fill the requirements admirably.

The principal points of interest in the device are the distributing shoe, guide yoke, compression springs, pipe connections and the location of the shoe with respect to the wheel, all of which are indicated in the cut. The lubricant is distributed through the medium of a small shoe which is fitted over the wheel flange and which accommodates itself very nicely to the varying conditions in the movement of the wheel, the vertical motion being taken by the light springs and the lateral movement by ample allowance between the guide yoke and the guides. A slight tension is given to these springs when allowance is made in tapping holes in the frame for the fixture which holds the shoe in position. The crude oil cup is placed in the engine cab at a point convenient to the engineer or fireman, and the feed for the lubricant is controlled at will by opening and closing a feed valve, and suitable pipes are laid from the cab directly to as many wheels as are to be treated. The amount of lubricant used is regulated in much the same manner as in the lubricators used for the main valves and cylinders, only it is more simply effected. Each drop of lubricant used is plainly visible to the engineer, and no more attention is required than that given to the cylinder lubricators. The sole manufacturer of the device is the J. C. Martin Sons Co., San Francisco, Cal.

TRAIN ACCIDENTS IN MAY.[1]

Following is a list of the most notable train accidents that occurred on the railroads of the United States in the month of May, 1908. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to write to the railroad manager for details or for confirmation.

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
7.	Bos. & Maine	Mechanicsville.	xc.	Ft. & Ft.	0	5
15.	Mo. Kan. & T.	Muskogee.	bc.	P. & Ft.	2	15
22.	A., T. & S. F.	Ripley.	bc.	P. & Ft.	1	3
24.	Chic., B. & Q.	Reynolds.	bc.	P. & Ft.	2	3
30.	N. Y., S. & W.	Middletown.	xc.	P. & Ft.	0	4
30.	Erie	Newburgh.	xc.	Ft. & Ft.	1	0

Derailments.

Date.	Road.	Place.	Cause of derlmt	Kind of train.	No. persons reported Kil'd.	Inj'd.
1.	Balt. & Ohio	Bradshaw, Md.	d. track.	Ft.	1	1
1.	Nor. Pacific	Butte.	malice	Pass.	2	2
5.	B. & O. S. W.	Sparksville.	washout.	Pass.	0	2
5.	Louis. & Nash.	Belleville.	washout.	Ft.	0	10
19.	Nor. & West'n.	Sand Bank.	d. track.	Pass.	0	10
20.	So. Pacific	Pinole.	b. rail.	Pass.	3	0
23.	Ft. W. & Den.	Wichita Falls.	washout.	Ft.	4‡	0
23.	Del. & E.	Arena.	malice.	Pass.	1	0
29.	Balt. & Ohio	Garrett.	unx.	Pass.	0	20

‡The killed were trespassers.

The derailment near Butte, Mont., on the first, is said to have been due to an explosion of giant powder under one of the two engines of the train. The leading engine was forced bodily upward, so that it jumped the rails, but it was not overturned. The second engine was derailed in consequence of the displacement of the leading one, and was overturned, killing the engineman. This engineman and one trespasser, who had been riding on the baggage car, were the only persons killed, though the fireman of the second engine was badly scalded. Forty-five sticks of giant powder had been stolen from a mine near the scene of the explosion the night before.

The derailment at Garrett, Pa., on the 29th, is believed to have been due to the distortion of the track by intense solar heat. The train was an eastbound passenger and it ran off the track on a curve where there was a low embankment, and the parlor car at the rear of the train fell down the bank. Fifteen passengers were injured.

Of the 15 electric car accidents which were of some consequence, as reported in the newspapers in the month of May, six are reported as having resulted in one or more fatalities. These were at Logansport, Ind., Chicago, Pensacola, Bayonne, N. J., Philadelphia and San Francisco. In the six electric accidents the number of fatal injuries is 10, and of less serious injuries 191. The Chicago accident was a butting collision of cars in the street. The accident in Philadelphia was a derailment on a steep grade, due to failure or mismanagement of

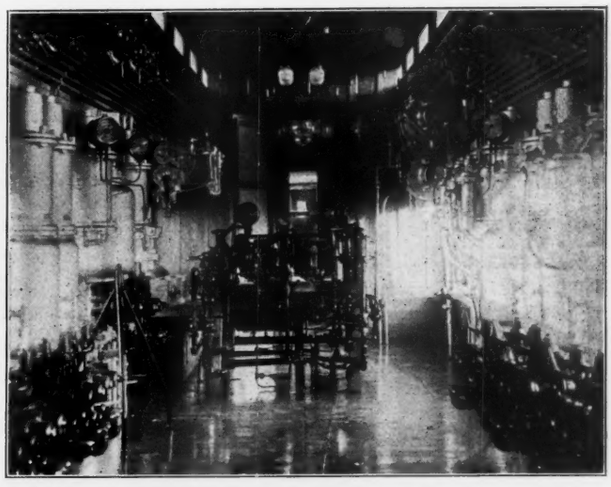
[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, Open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——Pass., passenger train——Ft., freight train (includes empty engines, work trains, etc.)——* Wreck, wholly or partly destroyed by fire——† One or more passengers killed.

the brakes, and the derailed car ran against and badly damaged two other cars, which were moving in the opposite direction on the adjacent main track.

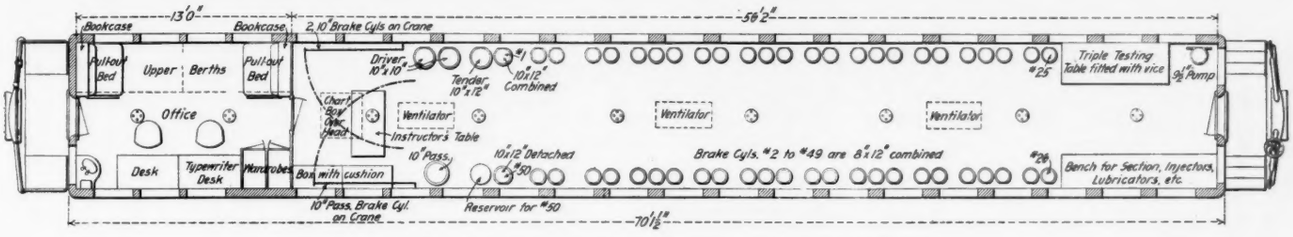
THE CENTRAL OF NEW JERSEY AIR BRAKE INSTRUCTION CAR.

The Central of New Jersey recently built, at its Elizabethport shops, the air-brake instruction car shown in the accompanying illustrations. It is 70 ft. long and 9 ft. 8 in. wide, over sills, and measures 54 ft. center to center of trucks. It weighs 150,000 lbs., and is carried on six-wheel trucks. At one end is the office, 13 ft. long, the arrangement of which is shown on the plan. The instruction compartment is 56 ft. 2 in. long. This is equipped with the freight air-brake equipment of a 50-car train, as well as two driver brake sets, one tender brake, and one passenger brake. These are all securely attached to a wrought iron framework which extends along both sides of the compartment. On the side of the car, by the instructor's table, is a crane carrying a 10-in. passenger brake cylinder with slack adjuster and P-1 triple in tandem. A small crane on the other side, directly opposite this one, carries two 10-in. brake cylinders with K and L triples and sectional triples arranged in tandem.

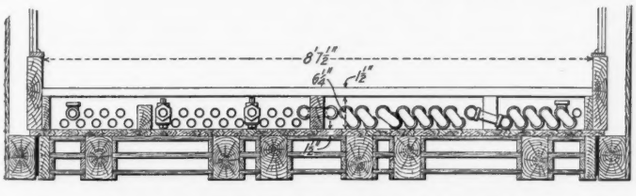
Interior of Air Brake Instruction Car.



Interior, Looking Toward Instruction Table.



Plan of Air Brake Instruction Car; Central of New Jersey.



Arrangement of Piping Under False Floor.

Five of the freight cylinders are equipped with a high-speed reducing valve, which can be cut in so as to operate as a passenger train. All the other cylinders are provided with a double bracket, so that a K and H triple valve can be attached. Either of these may be cut in, or both cut out entirely.

The brake piping rests on the car flooring, being covered by a false floor which is fastened to the sub-sills running longitudinally. Any part of this false flooring can easily be removed in order to get at the piping. Cut-out cocks are so arranged that groups of cylinders corresponding to 5, 10, 20, 30, 40, 45 and 50 cars may be cut in. The auxiliaries for the driver, tender and passenger cylinders are under the car.

The air signal instruction apparatus consists of a 12-car train equipment, which is under the lower deck on each side of the car. The instruction table is equipped with a No. 6 ET valve complete, with a distributing valve working in tandem, and also a G-6 engineer's valve, which can be used with or without straight air. They can be arranged for high pressure control or high speed brakes. Air pressure is supplied from a 9½-in. pump in one corner of the car. This can be operated by either steam or air, and can either be used direct, or compounded to get greater pressure for high speed brakes. There is no boiler in the car, as steam and air connections are made with pipe lines at the shops or stations where the car is being used. There is also no provision for cooking, since the car will always be located at points convenient to hotels. The office compartment has two desks, bookcases, a pull-out bed and two upper berths, as well as a clothes closet and a wash basin. In addition to the usual means of ventilation, there are three hatchways in the roof. These have hinged covers, which are held open or shut by a screw adjuster.

The car is lighted with Pintsch gas and is also wired for electric light. The current for this is to be obtained by making connections through flexible cables with circuits at the shops.

The underframe consists of eight 5-in. x 8-in. sills. The side sills are reinforced by a ⅝-in. x 7-in. plate bolted to them. There are four truss rods, two of which are attached to the side of the body bolster, while the other two extend to the end sills. The window posts are heavy enough to give a good support for the brake cylinder brackets.

The car is now on exhibition at the Atlantic City conventions. It was designed by B. P. Flory, Mechanical Engineer, and G. W. Rink, Chief Draftsman, under the supervision of William McIntosh, Superintendent of Motive Power.

General News Section.

The Texas State Railroad Commission has indefinitely suspended its order requiring the Colorado & Southern to buy large numbers of new cars and engines. The road has suffered severely by the recent storms and floods.

A press despatch from Milwaukee, June 17, says that the Chicago, Milwaukee & St. Paul has been fined $1,000 for violation of the eight-hour law, regulating the work of telegraphers. The case will be promptly appealed to the State Supreme Court.

The National First Aid Association of America held its third annual meeting at Boston, June 8. The President of the association is Miss Clara Barton. Among the speakers was A. P. Gillette, Secretary of the Boston & Maine Y. M. C. A. of Boston.

Mr. Brown, candidate for Governor of Georgia and formerly State Railroad Commissioner, proposes that the railroad commission of that state be reorganized, reducing the membership to three, and he would more strictly limit the powers of the commission.

Members of the per diem commission appointed some time ago by the executive committee of the American Railway Association are to meet this week to study the per diem question. James McCrea, President of the Pennsylvania Railroad Company, is chairman of the commission.

At the Exchange Street Station of the New York Central in Buffalo a rule has been adopted that baggage brought to the station by outgoing passengers shall be checked in the order of its arrival, the purpose being to make passengers with an excess of "nerve" get into line with other people.

Louis Ferris, arrested and tried on a charge of murder in connection with the wrecking of a passenger train near Butte, Mont., May 1, has been acquitted. The defense claimed that the derailment was due to a defective rail and not to dynamite. Ferris, who is 23 years old, had confessed to blowing up the train, but it was claimed that the confession had been extorted by "sweating," and was spurious; the jury appears to have taken this view.

A press despatch from Ottawa says that the government subsidy paid to the Canadian Pacific for carrying transcontinental mails is to be reduced. The discontinuance of the fast train from Montreal to Vancouver was announced some weeks ago. Henceforth the company will receive £45,000 a year, of which £25,000 comes from the British government. From this it would appear that the Canadian government will pay £20,000 a year, or twice what it has paid hitherto. The subsidy applies to the whole route from Liverpool to Hongkong.

The Alabama State Board of Equalization has relieved domestic railroad corporations in Alabama of the special tax formerly assessed for the support of the Railroad Commission. Under the old law railroad corporations were assessed a tax not to exceed $500 in any one instance, the proceeds of which were to go to support the State Railroad Commission. This tax ran from June 1 to June 1. A section of the new code assesses a special franchise tax in lieu of the old tax. But as the taxes overlap one another the roads will owe for five months of the old tax for this year. By action of the board which has in charge railroad taxation matters, the old tax is now remitted for domestic railroad corporations. The foreign railroad corporations are assailing in the courts the justice of the franchise tax and in their cases no action has been taken.

The State Federation of Commercial Clubs, at a meeting at Guthrie last week, appointed a committee to prepare an amendment to section 9, article 9, of the Oklahoma State Constitution, so as to permit new railroads to be built under state charters and afterward leased or sold to foreign corporations, provided said new lines are not parallel to or in direct competition with lines buying, leasing or operating them. This committee is to take such steps as are necessary to have such an amendment submitted to the people at the next general state election in November. The committee is composed of G. B. Stone, of Oklahoma City; D. K. Cunningham, of Kingfisher, and J. M. Aydelotte, of Shawnee, who have authority to name the other two members. That section of the state constitution which they would amend is as follows: "Neither shall any railroad company, transportation company or transmission company, organized under the laws of this state, consolidate by private or judicial sale with any railroad, transmission or transportation company organized under the laws of any other state or the United States."

A Massachusetts View.

The Republicans of the state of Washington have pledged themselves to enact a corporation law "similar in spirit and purpose to the public utilities law of New York state." It used to be Massachusetts that was pointed to as a model in respect to public-service corporation control. We now seem to have fallen behind New York, which, under the Hughes public-utility statute, undertakes to use power as well as discretion in the regulation of monopoly charges.—*Springfield Republican.*

A Steamboat as a Switcher.

An amusing incident of the flood, about as interesting as when five years ago the Spread Eagle nearly collided with a locomotive when both were navigating the levee near the foot of Piasa street, occurred Tuesday evening when the towboat "Moline," belonging to the Mississippi Sand Co., was used to help a Bluff Line engine do some switching of cars of sand. The navy department of the Bluff Line succeeded in doing what the regular switching equipment could not do. Three carloads of sand were to be switched out of the incline track near Lover's Leap and the yard engine could not move them, the river having risen so it was impossible to get the cars out. The river was likely to rise and wash all the sand out of the cars if they were allowed to remain there, so the sand company sent their towboat, "Moline," to the rescue and getting behind the last car, in deep water, began pushing while the yard engine struggled with all its might at the other end. The cars were quickly transferred to a place of safety.—*Alton (Ill.) Evening Telegraph.*

Punctuality on the Boston & Albany.

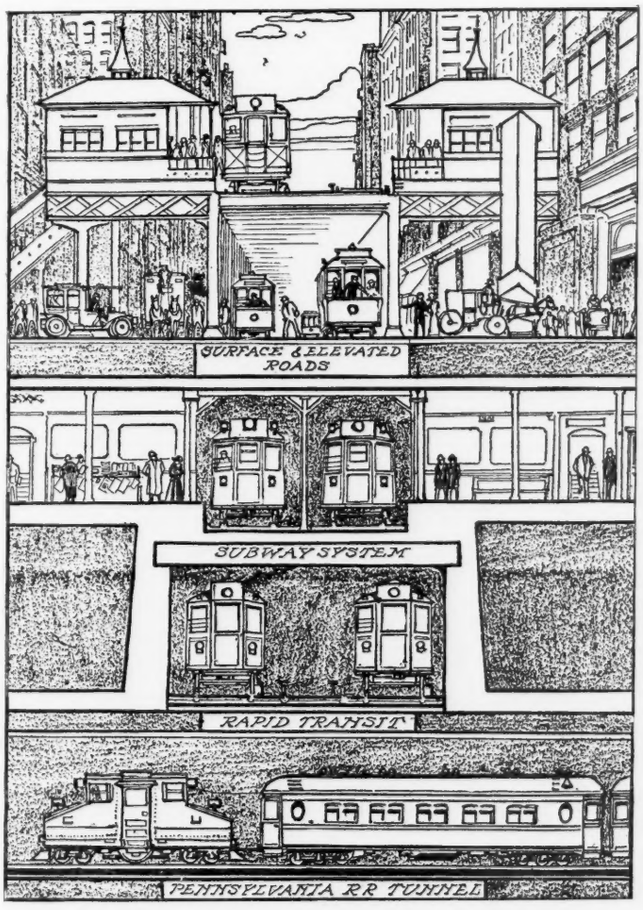
On the desk of the General Manager, A. H. Smith, of the New York Central lines, is a thin, precious volume. The like of it has not been seen for several years—during two presidential administrations of one President. It consists of praise of the improved working of the Boston & Albany division under the administration of General Manager Hustis. The praise is expressed in some letters from customers and in 19 editorial articles from newspapers published along the line. The Boston *Post* thinks that: "A memorial tablet in enduring bronze should be placed in the south terminal, declaring this triumphant conquest of the difficulties of railroad operation." The Boston *Traveler* finds it "pleasant to banish hatred toward a haughty corporation from our hearts." The *Globe* says: "The Boston & Albany service is now all that its patrons could desire." Another editor notes: "A carload of flour arrived in Boston from Cleveland in three days." Among the letters none appear from District-Attorney Jerome or Attorney-General Bonaparte.

The reform in train operation has been notable. A year and a half ago the Massachusetts Railroad Commission said: "The situation on the Boston & Albany has been exasperating. Timetables have been in a large degree worthless; inquiries of officers as to what train and as to when any train would next arrive or move out have been much of the time to no pur-

pose." During a recent month 663 out of the 700 through trains between Boston and Albany were on time. Of the 448 trains between Boston and Springfield, 440 were on time. Of the 4,508 Newton circuit and South Framingham trains, 4,353 were on time. During this month 96 per cent. of all trains were on time, and the average delay of all trains was only 21 seconds. The reform is an important one, and the management, in addition to that satisfaction which comes from the consciousness of the performance of duty, is having the somewhat novel experience of warm expressions of approval from its customers.

Transportation Five Cars Deep.

The artist of the *New York Times* has drawn the accompanying sketch to illustrate a cross section of New York at the junction of Broadway, Sixth avenue and Thirty-fourth



New York Rapid Transit.

street. All the lines shown are built or building except the one marked "subway system," which is projected, but does not now exist under Sixth avenue. The McAdoo Hudson tunnel extension is marked "rapid transit."

The Typewriter in Telegraphy.

The pen used to be mightier than the sword, but there are no swords and very few pens in large American telegraph offices nowadays. The telegraph companies do not supply the typewriters. Each man has to furnish his own machine. It was not till about 1890 that the typewriter began to come into general use. The typewriter has resulted in considerable speeding up of telegraph work, but the real advantage does not lie so much in increased output as in rescue from pen slavery. The nervous strain and muscular drudgery of rapid writing is enormous compared with the same work done on a typewriter.

Operators who ranked only as second class on account of slowness or defects of penmanship have become first class. Formerly the sending operator on the Morse key could make the receiving operator "sit up." With the advent of the typewriter, however, the position is now reversed, and the receiver can take with ease all that the finest star operator can send. In America this has led to the extensive use of word contractions, and these have been standardized and published in a manual known as "Phillips Code." Here, for instance, is an example of the way in which press messages are sent in the United States:

Mems o cx Cgs rptg und cv cmns o eno cap wo krp xgn ifo thr adhts wi cmb aga ay emt to t crpns, bt cujx es dtmd efo qpt peo f sq stas wi efy dmz ay osn.

Members of Congress representing under cover combinations of enormous capital who corrupt legislation in favor of their adherents will combine against any embarrassment to the corporations, but courageous and determined effort on the part of the people of the separate states will effectually demoralize any opposition.

With an intelligent sender matter of this sort can be transmitted at the rate of 55 words a minute. It is not a rare thing for two first class press operators in America, one sending "code" and one receiving on the typewriter, to handle 20,000 words of press in one night. The record is said to have been 24,000 words transmitted and received in eight hours.

The code contractions for common phrases are works of art. Here are a few examples:

Fapib—Filed a petition in bankruptcy.
Dbf—Destroyed by fire.
Cats—Created a tremendous sensation.
Ckx—Committed suicide.
Asaph—A speculative demand with prices higher.
Bsql—Business small and quotations lower.
Herdam—Heavy receipts depress the market.
Utc—Under the circumstances.

Both the Western Union and the Postal telegraph companies have a large number of "bonus" circuits on which the operators are paid a halfpenny per message for all that they send over about 300 per day, and a speed of 40 messages an hour is quite ordinary, a speed of 60 messages an hour is regarded as very good, and 80 messages an hour have been transmitted for hours at a time.

In Canada and other new countries the typewriter is also being quite freely used in telegraphy. On the Continent of Europe there is but little scope for it, as the bulk of the traffic is handled by the Hughes instrument, but in Russia the large telegraph offices employ dozens of typewriter girls to type up messages from the received Wheatstone slip, the Wheatstone being extensively used in Russia, owing to the immense distances covered by the telegraph network.

Between 8 a.m. and 5.30 p.m. a good man will handle about 300 messages on a New York-Boston circuit, 325 on a New York-Philadelphia circuit, 280 on a New York-Chicago, and so on, the allowances being made for more interruptions to the longer circuits. There is no science in the proportions; the minimum is arbitrarily determined after observation. With these figures to be reached between 8 and 5.30, each operator on the piece-work circuits is allowed 1 cent a message for each message handled in excess of the minimum; or, if he prefers to cease work when he reaches the minimum he is excused and paid his regular salary for the full day. There are comparatively few circuits that can be operated in this manner. The increase in speed is considerable. It is not uncommon for an operator to handle a hundred messages more than the minimum, and sometimes operators handle 500 messages in a day. I have known one or two cases where 600 have been handled. Operators are not required to work at these very high speeds; but usually they are applicants for these circuits. It takes "good men" to work them, and operators like to be known as capable of such work. They are required to do good, clear, accurate work, and they are held to the usual accountability for errors. Abbreviating the text (coding) is prohibited. The bonus system, like every other, fails to manage itself. There is temptation to do this, that, and the other thing that cannot be permitted; but, instead of sitting at a "busted" wire perfectly content to do nothing, the bonus operator co-operates with the chief in making stops as few and short as possible.—*The Post Office Electrical Engineers' Journal, London.*

"A Jury of His Peers."

The difficulty which is experienced by a Texas railroad whenever it tries to get justice from a jury has been aptly illustrated many times; but one of the most recent instances, a criminal case, is extreme, even for Texas. The Galveston, Harrisburg & San Antonio had suffered much from freight car burglaries, and determined to put a stop to the practice. A loaded car was selected, sealed and watched until 9 o'clock at night. The car was then opened, one of the road's watchmen put in it, and the car again sealed. Soon the car was approached by two men, one of whom broke the fastening of the car and entered it. After making an investigation of the contents, he put a box on his shoulder and started off. At that moment he was arrested by the road's watchman and turned over to the police. The arrested man employed a lawyer to defend him, but when the lawyer heard the evidence he refused to take the case, and the prisoner went to trial without counsel. He was prosecuted by the District-Attorney, and the evidence against him appeared to be complete. The jury brought in a verdict of acquittal! The presiding judge said he was never more surprised at a verdict in his life; and the railroad officers were too disgusted to say anything.

Everyday Heroism.

For five hours to-day Clear Cowan, a locomotive engineer of the Delaware & Eastern Railroad, was held in the cab of his overturned locomotive in the bed of the East Branch of the Delaware river, in water which came within an inch of his mouth. Cowan directed the work of the wrecking crew which was trying to release him, and when it was all over and he was taken out of the water he refused a drink of whisky which some one had offered as a stimulant. A part of Cowan's train left the rails near Arena, and rolled down a 15-ft. embankment into the river. A spike was found on the track, and it is believed the train was wrecked purposely. Cowan's feet were caught in the reverse lever. The fireman tried to pry him loose but was unable to do so. Then he held the engineer's head up, the water being within an inch of his mouth, while the trainmen tried to free Cowan, but still unsuccessfully. There were no appliances at hand to lift the engine and to get at the reverse lever where it was holding Cowan, the men had to go under water. Not being able to stay long and the current being quite strong they made small progress. Finally, at the suggestion of the engineer, several of the men standing on the trucks thrust one of the crew head foremost down into the water. After repeated failures and five hours' hard work they were able to move the lever so that Cowan was released.—*New York Times.*

The Danger of Staying at Home.

"Railroad casualties receive such wide publicity," said a leading insurance man, "that there is a common belief on the part of the public that one is more liable to accidents while traveling than when living the simple life in the confines of his home. As a matter of cold fact, statistics show that accident insurance companies pay more losses to people who are injured in their own homes or on their premises than they do to people hurt in railroad accidents. Insurance companies pay more money to people who get hurt hanging pictures or taking stoves apart than they do to the victims of collisions. It sounds strange, but it's the truth."—*Cleveland Leader.*

The First Telegraph Wire Operated in America.

In one of the locked alcoves of the library of Princeton University is a manuscript volume of some 76 pages written by Professor Joseph Henry, the famous electrical scientist, giving an account of his researches while a professor at Princeton. It was across the Princeton campus that Henry strung what is said to have been the first telegraph wire ever operated in America. Before he left Albany he had been working at his invention of the electro-magnet for transmitting signals at a distance whereby dots might be made on paper and bells struck, indicating letters of the alphabet. He refused to patent this invention on the ground that it was incompatible with the dignity of science to confine the probable benefits to the use of any one individual. In his statement he says: "I think the first actual line of telegraph using the earth as a conductor was made in the beginning of 1836. A wire was extended across the front campus from the upper story of the college library building to the philosophical hall on the other. Through this wire signals were sent from time to time from my house to my laboratory." The operator at the other end of the line was usually Henry's wife, and the exchange of communications between the two seemed to undergraduates of those days little short of miraculous.—*Telegraph Age, June 1.*

Japanese in Manchuria.

Following prolonged negotiations at Tokio and Peking on the commercial development of Manchuria, the Japanese government has informed China that Japan will throw no obstacle in the way of the development of Chinese territory in Manchuria. On the contrary, Japan declares her willingness to assist in this work, and, therefore, will offer no objections to the construction of the Hsin-Min-Tun & Fakomen Railroad, giving it a connection at some point on the South Manchurian Railway.

Traffic News.

Members of the United Commercial Travelers announce that a new mileage book will soon be issued by the interurban railroads of Ohio, Indiana and Michigan at 1¾ cents a mile, interchangeable.

The Southern Pacific Company has announced that, beginning July 1, the rates for extra baggage on the company's lines will be reduced one-half. The rates at present are about 1 cent per 100 lbs. per mile.

The Erie has resumed the running of passenger trains between Buffalo and Niagara Falls and now has three daily trains between the two points. The service was discontinued last winter as a matter of economy.

In the Federal Court at Toledo, Ohio, June 23, the Toledo Ice & Coal Company pleaded guilty to three counts charging it with receiving rebates from the Ann Arbor Railroad. Judge Taylor assessed a fine of $1,250 on each count. The remaining 152 counts in the indictment were dismissed.

American vessels are henceforth to be excluded from the coasting trade of Canada on the Pacific. For some years the coasting laws of Canada have been suspended, as far as the Pacific coast is concerned, owing to the insufficiency of Canadian and British vessels, but after August 1 Canadian goods cannot be carried in bond from an American port on the Pacific to a Canadian port unless the water carriage is by a Canadian or British registered vessel.

The New York City grain exporters, who have been complaining of the freight rates on grain from the West to New York, and who declare that the high rates explain why nearly all of the export grain is now going to Montreal, report that the railroads have agreed to make a reduction. It appears that the boatmen on the Erie canal are nearly as bad, in the eyes of the exporters, as are the railroad men, the boat rate on wheat from Buffalo to New York at present being five cents a bushel, which is only half a cent lower than the rate by railroad. The boatmen say that the expense for steersmen and drivers is now very high.

Reports received by the Secretary of Commerce and Labor show that the total immigration into the United States from all countries during the month of May was 36,317, a decrease of 76 per cent., compared with May, 1906, and 80 per cent., compared with May, 1907. The immigration from all countries during the six months ended May 31, 1908, was 227,283, a decrease of 66 per cent., compared with the six months ended May 31, 1907. Almost half a million aliens departed from this country during the eight months ended Feb-

ruary 29, 1908, and 736,599 arrived during the same period, leaving a net increase to our population by immigration of 252,731.

The Mexican Government has withdrawn its objections to a ruling of the interstate commission, made a year ago, which required the publication in the United States of passenger fare tariffs in which more than one carrier participates, and the several Mexican roads will file in Washington notice of their concurrence in any tariff under which tickets are sold from the United States to points in Mexico. There has been no objection to compliance with the ruling by the Mexican roads. A clause attached to the form prepared to notify concurrence of Mexican roads specifies that the concurrence is filed with the commission without prejudice to the authority of the Mexican Government.

In connection with the recent announcement by the railroads that shippers will be more rigidly required to mark all packages of freight, the Georgia State Railroad Commission has issued a circular calling attention to the commission's rules, requirements and recommendations in this matter. The commission has in the past done what it could to secure the prompt settlement of claims for overcharge loss and damage, and it finds that within the past few months a great improvement has been made by the railroads. After quoting the rules of law under which the railroads may rightfully carry on their business, it is stated that if any unreasonable rule or regulation is made, the commission, on application, will endeavor to see that it is corrected. In any case, if injustice results, the commission, on complaint, will undertake to see that justice is done.

To a published statement made by W. B. Biddle, Vice-President of the Rock Island, in the controversy between that road and Omaha shippers [*Railroad Age Gazette*, June 19, p. 198] the Commercial Club and Grain Exchange of Omaha have replied to the effect that (1) nearly every line competitive with the Rock Island-Frisco opposed Mr. Biddle's adjustment. (2) That the files of the transportation committees fail to disclose any record of the "repeated efforts" to settle the controversy (with one exception, noted below). (3) Mr. Biddle never offered to leave the decision to a board of arbitration, consisting of Mr. McVann, Mr. Wilson and Mr. Boyd. He did suggest to Mr. McVann and to Mr. Wilson that they submit the matter to Mr. Boyd. The Grain Exchange sent Mr. McVann to Kansas City twice in an effort to get the Kansas City people to agree to a basis for submitting the question to some disinterested party, but Kansas City absolutely refused to do so, except upon terms that would insure a decision under which Kansas City would retain all it had gained, and obtain more. (4) It is not true that the only settlement which the Omaha business men would accept was an unconditional surrender, by the Rock Island-Frisco. The commercial interests of Omaha, on June 3, 1907, made an offer which Mr. Biddle never acknowledged, nor did he ever discuss it with our people.

The Railway Ticket Protective Bureau announces that Walter S. Clinton, a ticket scalper of St. Louis, has been sentenced to six months' imprisonment on an indictment for forgery in the fourth degree. Clinton has been prosecuted several times before, but this time the bureau had evidence that he had disposed of several stolen tickets obtained from the professional ticket-office burglar, R. A. Gaver. Clinton was paroled, conditioned on good behavior for two years and on keeping a promise not to re-engage in the business of ticket scalper. The bureau reports that St. Louis is now and for several months has been absolutely free from the ticket scalping evil. Another circular from the bureau tells of the arrest and conviction of the Gaver above referred to. He has been sentenced to the Indiana State Reformatory at Jeffersonville for a term of not less than 10 nor more than 20 years. Gaver has stolen many pieces of baggage by first stealing checks and then putting them on to valuable trunks. At one time and another he has taken the entire stock of tickets from offices at six or eight places in the Central states. After robbing a ticket office Gaver always walked to some other railroad to begin his flight, and he would pay his fare, not running the risk of using any of the stolen tickets just then. In the present trial he pleaded guilty and did not engage counsel.

INTERSTATE COMMERCE COMMISSION.

Delay in Posting Tariff Justifiable.

Pueblo Transportation Association v. Southern Pacific. Opinion by Commissioner Clark.

A tariff filed within the time and in the manner prescribed by law is lawfully binding upon both carriers and shippers, though it was not posted at stations full 30 days prior to its effective date. The delay in posting tariff in this case was due to unforeseen causes, and it must not be understood that neglect to post tariffs or wilful failure so to do can with impunity be resorted to by carriers.

Shortage of Sidings Similar to Car Shortage.

Rail and River Coal Co. v. Baltimore & Ohio. Opinion by Commissioner Harlan.

Any regulation or practice that withdraws from a shipper the equal opportunity of taking advantage of the rates offered by a carrier is a regulation or practice "affecting rates." The principles announced in a former case in regard to the distribution of private coal cars and foreign railroad fuel cars were adhered to and reaffirmed with a reference to the obvious relation between a shortage in cars and an insufficiency of motive power, sidings, train crews and other facilities which usually accompany a car shortage. The defendant was ordered to count railroad fuel cars and leased or private cars against the distributive shares of available cars to which the operators are entitled on interstate shipments of coal.

Lumber Rates from the Northwest.

Oregon & Washington Lumber Manufacturers' Association v. Union Pacific et al.; Pacific Coast Lumber Manufacturers' Association et al. v. Northern Pacific et al.; Southwest Washington Lumber Manufacturers' Association v. Northern Pacific et al. Opinion by Commissioners Clements, Prouty, Cockrell and Clark.

The reasonableness of a general advance in the lumber rates, in many cases of 20 or 25 per cent., from North Pacific coast territory to nearly all points east thereof, which became effective in November, 1907, was challenged. In reports by Commissioners Clark and Clements the Commission decided that the advanced rates applying to all points on and west of a line drawn from Pembina, N. Dak., through Grand Forks, N. Dak., Moorhead and Breckinridge, Minn., Sioux City and Council Bluffs, Iowa, St. Joseph and Kansas City, Mo., and thence to Port Arthur, Texas, along the Kansas City Southern, including also all points east of that line which now take the same rates as any point located on the line between and including Sioux City, Iowa, and Kansas City, Mo., were unreasonable, and by its orders restores the lower rates which were in effect on and prior to October 31, 1907.

A part of the increase made by the carriers to the more distant markets lying east of the Missouri river is permitted to stand. The maximum increase authorized to eastern territory, however, is 5 cents per 100 lbs. over the old rates to Duluth, Minneapolis, St. Paul and Minnesota Transfer and to points on and east of the Mississippi river. Approximately 50 per cent. of the increase made by the carriers is condemned, resulting in a reduction of about 5 cents per 100 lbs. in the rates now in effect.

Western Oregon Lumber Manufacturers' Association et al. v. Southern Pacific Co. et al. Opinion by Commissioner Prouty.

An advance in the rate on rough green lumber from points in the Willamette valley, Oregon, to San Francisco, Cal., from $3.10 to $5.00 per ton, made effective in April 1907, is condemned. The old rate of $3.10 per ton applied from all mills upon the east bank of the Willamette river and from mills south of Corvallis, Ore., upon the west bank; from mills north of Corvallis upon the west bank an additional charge of 25 cents per ton was made, but this rate did not apply from Portland, Ore. The advanced rate of $5.00 per ton applied to all mills in the Willamette valley, upon both sides of the river,

including Portland. The advanced rate of $5.00 per ton from all mills in the Willamette valley, not including Portland, is unjust and unreasonable. From mills upon the east bank and upon the west bank, south of Corvallis, the rate should not exceed 17 cents per 100 lbs., or $3,40 per ton, and that from points upon the west bank, north of Corvallis, it should not exceed $3.65 per ton. No reduction is made in the rate from Portland, since shippers from that point have the benefit of a water rate and are not dependent upon the rail carriers for reaching the San Francisco market; and the rate of $3.10 per ton has not been in force from there for the last four years.

Pacific Coast Manufacturers' Association et al. v. Northern Pacific Railway Co. et al. Opinion by Commissioner Prouty.

A satisfactory through route, within the meaning of the statute, already exists from Washington points to Colorado common points and destinations east thereof, and therefore the Commission has no authority to establish another through route to those destinations. The Northern Pacific, Northern Pacific Terminal of Oregon, the Oregon Railroad & Navigation Co., the Oregon Short Line, and the Union Pacific are, however, required to establish through routes for lumber from points on the line of the Northern Pacific in Washington north of Portland, Ore., as far as Seattle, Wash., through Portland to Ogden, Utah, and Salt Lake City and common points in Utah, and a rate of 40 cents per 100 lbs. on fir and spruce lumber, and 50 cents per 100 lbs. on cedar lumber and shingles is prescribed for such through transportation.

Chairman Knapp and Commissioner Harlan dissent from the conclusions reached by the majority, on the ground that the major portion of the advance in rates was reasonable.

Potlatch Lumber Co. et al. v. Northern Pacific et al. Opinion by Commissioner Cockrell.

Differential rates on lumber from what are termed Spokane rate group points, Montana-Oregon group rate points and Hood River, Ellensburg and Leavenworth districts, which lie in the territory east of the Cascade mountains, in Washington and Oregon, and from the entire state of Idaho, to Eastern territory are established. Rates from the Spokane district should be lower than from the Pacific Coast and more uniform differentials should be made under the coast rates than were in effect prior to November 1, 1907, on the general grounds that from this district the haul is much shorter and the mountain grades over the Cascades and the long haul through the wide treeless farming section intervening between the coast and the Spokane district are not incidents to this transportation as they are to the transportation from the coast.

Reweighing Charge Reasonable.

P. J. Rice v. Georgia Railroad. Opinion by Commissioner Clark.

The complaint alleged unjust discrimination in that defendants' charges for transportation of coal from Jellico, Tenn., to Augusta, Ga., are higher than from coal fields in Alabama approximately equidistant from Augusta; violation of the fourth section of the act, in that defendants transport coal from Jellico to Charleston, S. C., through Augusta, at less rates than are charged to Augusta, and that the rates on coal from Jellico to Augusta are unreasonable *per se*. The conditions, physical and otherwise, under which coal is transported from Jellico to Augusta are so dissimilar to the conditions under which coal is transported to Augusta from the Alabama fields as to warrant defendants in charging more for the haul from Jellico, and defendants may not be required to meet the rate from the Alabama fields. The fact that the tonnage of coal reaching Charleston, S. C., by water is double that hauled there by rail creates competitive conditions at Charleston which do not exist at Augusta, and which relieve defendants from the charge of violation of the long and short haul provision of the law. Defendants' rates on coal from Jellico to Augusta are not unreasonable.

The complaint also alleged that defendants' rule providing that on demand of consignee and on the deposit of $2, defendants will reweigh carload shipment, and if such reweighing discloses a variation of more than 2 per cent., with minimum of 1,000 lbs. from original shipping weight, original weight and charges will be corrected accordingly and the $2 reweighing charge be refunded to consignee. But if reweighing fails to disclose such variation of 2 per cent., original weight and charges will not be changed and the reweighing charge will be retained by defendants. This reweighing charge is reasonable, but the provision that no correction will be made for variation of less than 2 per cent., with minimum of 1,000 lbs., is unreasonable and should be changed to provide for correction of original weight and charges when variation of 1 per cent., with a minimum of 500 lbs., is disclosed.

STATE COMMISSIONS.

Wisconsin. Experimental Trains Discontinued When Unprofitable.

M. D. Leonard et al. v. Wisconsin Central; J. H. Coon et al. v. Wisconsin Central.

In an order of September 14, 1907, the Wisconsin Central was compelled to operate the northbound freight train, which at present leaves Portage at 4 a.m. and arrives at Stevens Point 9.30 a.m. experimentally through Montello for a period of two months. It was shown that the train operated in this way was unprofitable, and it is therefore reasonable to discontinue operating it through Montello.

Wisconsin. Trainload Rates Are Not Encouraged.

Edward Hines Lumber Co. v. Chicago, St. Paul, Minneapolis & Omaha.

The defendant makes a rate of $2 per car on logs, minimum, 35 cars per day from Hines to Hayward. The complainant alleges that owing to delay on the part of the railroad company in furnishing necessary cars it was not possible to ship the required minimum number of cars per day. The complainant shipped 36 trainloads of logs, varying from 17 to 34 cars per train between November 7, 1907, and January 24, 1908, paying $70. per train. It claims that $60 per train was the reasonable rate and asks the railroad company to refund $660. While the cost of transportation in trainload lots is somewhat less than in less than trainload lots, the difference is not sufficient, in the judgment of the commission, to warrant such a classification, and trainload rates are not to be encouraged. The defendant is ordered to pay the complainant $660.

Ohio. Carrier Entitled to Reasonable Notice of Shippers' Car Requirements.

Complainant manufactures hollow blocks and other clay products and is a competitor of the National Fireproofing Co. Both of the companies are in Magnolia, Carroll county, Ohio, and both ship over the Pennsylvania. The National Fireproofing Co. operates 22 kilns and employs about 108 men, while the complainant operates 10 kilns and employs regularly about 60 men. When both of these companies demand cars at the same time and the Pennsylvania has an insufficient number of cars to supply the entire demand of both, the Pennsylvania gives a greater proportion of the cars to the National Fireproofing Co. This is not a discrimination. No system of apportionment, according to an inflexible rating, can be applied to such industries that will not result in more or less injustice by reason of the irregularity and daily changing conditions affecting requirements of cars. It is suggested, therefore, that hereafter cars available for loading at Magnolia be distributed daily between the National Fireproofing Co. and the Greer-Beatty Clay Co. as nearly as possible in the ratio of their respective carload shipments ready to move. If the business of an industry is so uncertain that a carrier is unable to keep itself informed as to what future requirements for cars may be, the burden should rest with the shipper —where it belongs.

Freight Traffic Agents' National Association.

The second annual convention of the National Association of Freight Traffic Agents was held at Put-in-Bay, June 19. The election of officers for the ensuing year resulted in the choice of William J. Byrth, of Cincinnati, as President, and G. B. Hild, of Cincinnati, as Secretary.

REPORT OF REVENUES AND EXPENSES OF RAILROADS.

MONTH OF APRIL, 1908.

(See also issues of June 19, June 12, June 5.)

Name of road.	Mileage operated at end of period.	Operating revenues: Revenue, Freight.	Revenue, Passenger.	All other revenue from transportation.	Revenue, operations other than transportation.	Total operat'g revenues.	Operating expenses: Maintenance: Way and structures.	Maintenance: Of equipment.	Expenses: Traffic.	Expenses: Transportation.	Expenses: General.	Total operating expenses.	Net operating revenues (or deficit).	Taxes.	Operating income (or loss).
Atlanta & Birmingham Air Line	237	$40,273	$17,879	$2,450	$640	$61,242	$10,403	$10,380	$2,055	$28,298	$3,328	$54,464	$6,778	$3,166	$3,612
Atlantic City	168	48,065	56,285	3,268	822	108,440	29,931	18,410	3,643	58,504	376	110,864	2.424*	7,000	†9,424
Buffalo & Susquehanna	372	111,366	12,409	3,588	1,153	128,516	26,962	34,078	1,589	58,717	4,955	126,301	2,215	4,000	†1,785
Central New England	293	153,995	24,109	10,957	499	189,560	21,452	22,910	1,659	62,875	1,915	109,911	79,649	4,800	74,849
Charleston & Western Carolina	341	80,003	21,054	4,945	970	106,972	21,161	22,958	2,876	54,102	3,241	104,338	2,634	4,500	†1,866
Chicago, Indiana & Southern	329	162,460	14,764	5,117	933	183,274	34,698	24,407	6,998	68,779	17,285	152,167	31,107	7,000	24,107
Chicago, Peoria & St. Louis of Ill...	255	70,633	22,128	5,333	1,128	99,222	18,818	23,550	5,940	47,604	4,551	100,463	1,241*	4,500	†5,741
Cincinnati Northern	248	49,366	12,182	3,897	263	65,708	19,579	7,753	2,336	27,788	1,857	59,313	6,395	4,000	2,395
Cleveland, Akron & Columbus	210	101,664	30,796	10,844	780	144,084	21,734	31,723	2,208	48,986	2,941	107,592	36,492	2,500	33,992
Cleveland, Lorain & Wheeling.....	194	135,065	15,456	5,745	75‡	156,191	33,994	52,326	5,541	82,356	4,959	179,176	22,985*	9,704	†32,689
Detroit & Mackinac	344	69,674	21,336	4,665	447	96,122	7,850	15,598	1,801	33,572	2,251	61,072	35,050	6,612	28,438
Detroit, Toledo & Ironton	486	85,971	9,430	5,989	1,404	102,794	19,897	18,934	2,286	53,171	2,606	96,894	5,900	7,000	†1,100
Duluth, Missabe & Northern	275	50,938	25,350	2,318	1,121	79,727	39,917	30,802	504	48,892	7,098	127,213	47,486*	3,189	†50,675
Eastern Ry. Co. of New Mexico.....	221	38,208	33,266	2,892	774	75,140	10,866	6,298	738	23,183	1,892	42,977	32,163	4,705	27,458
Elgin, Joliet & Eastern	237	149,646	33	3,972	2,728	156,379	17,972	18,494	2,390	56,469	5,275	100,600	55,779	12,000	43,779
Fort Smith & Western	217	23,177	13,494	2,253	1,882	40,806	13,990	11,701	1,020	17,944	2,964	47,619	6,813*	650	†7,463
Fort Worth & Denver City	454	175,213	107,637	13,410	1,275	297,535	50,031	49,340	6,457	111,383	14,429	231,640	65,895	12,818	53,077
Georgia R. R.	307	142,201	56,116	12,225	1,553	212,095	41,230	45,462	8,539	105,832	7,838	208,902	3,193	1,123	2,070
Georgia Southern & Florida	395	74,016	42,459	20,568	734	137,777	18,563	42,284	5,267	63,160	8,612	137,886	109*	7,426	†7,535
Green Bay & Western	225	29,149	11,510	3,716	256	44,631	6,780	6,254	272	13,694	1,503	28,503	16,128	2,527	13,601
Gulf & Ship Island	307	110,719	25,313	5,405	2,200	143,637	35,891	24,418	1,262	53,022	7,026	121,619	22,018	4,615	17,403
Midland Valley	323	53,232	18,313	3,304	1,069	75,918	17,420	12,476	1,750	25,092	3,649	60,387	15,531	3,217‡	18,748
Mobile, Jackson & Kansas City.....	402	74,711	20,291	4,260	1,982	101,244	21,983	9,982	1,630	37,352	9,548	80,495	20,749	3,106	17,643
Nevada & California	330	55,001	28,988	6,485	615	91,089	14,514	5,598	779	62,716	3,092	86,699	4,390	20,000	†15,610
Pittsburg, Shawmut & Northern.....	244	44,727	6,940	1,094	855	53,616	13,135	24,168	931	23,216	3,128	64,578	10,962*	1,347	†12,309
St. Louis, Brownsville & Mexico.....	442	71,377	24,388	3,525	737	100,027	18,775	10,073	2,374	34,818	3,338	69,378	30,649	3,000	27,649
Santa Fe, Prescott & Phoenix	257	65,795	26,922	4,193	1,919	98,829	25,556	8,147	2,028	26,063	4,928	66,722	32,107	.....	32,107
Southern Pac. Co., Pacific System...	5,537	3,740,561	2,228,015	336,828	59,304	6,364,708	902,535	836,811	117,309	1,775,289	177,758	3,809,702	2,555,006	245,300	2,309,706
So. Pac. Co., Atlantic S. S. Lines....	None.	374,760	54,500	11,085	950	441,295	267,105	84,907	22,310	73,742	11,422	459,486	18,191*	.....	†18,191
Texas Central	268	19,225	13,096	4,518	558	37,397	22,954	12,780	1,071	23,595	4,263	64,663	27,266*	3,244	†30,510
Toledo & Ohio Central	441	136,485	44,390	8,494	550	189,919	27,914	38,191	4,773	88,107	5,762	164,747	25,172	11,099	14,073
Toledo, Peoria & Western	248	51,528	25,850	4,019	613	82,010	20,795	19,966	1,807	35,805	3,089	81,462	548	4,400	†3,852
Toledo, St. Louis & Western.....	451	186,113	39,519	15,800	2,562	243,994	25,948	23,947	9,915	100,705	13,026	173,541	70,453	13,000	57,453
Trinity & Brazos Valley.....	421	67,301	7,771	1,770	478	77,320	26,244	17,222	3,691	57,938	9,987	115,082	37,762*	2,000	†39,762

TEN MONTHS OF FISCAL YEAR, 1908.

(See also issues of June 19, June 12, June 5.)

Atlanta & Birmingham Air Line	237	$504,227	$205,769	$23,400	$7,607	$741,003	$129,726	$104,880	$11,203	$326,171	$12,908	$584,888	$156,115	$31,667	$124,448
Atlantic City	168	518,204	824,722	54,247	10,610	1,407,783	284,548	191,657	19,123	734,764	7,516	1,237,608	170,175	70,000	100,175
Buffalo & Susquehanna	372	1,551,060	160,520	35,620	29,118	1,776,318	370,966	427,745	19,193	666,248	60,165	1,544,317	232,001	40,000	192,001
Central New England	293	1,374,021	276,843	113,475	8,078	1,772,417	398,017	250,751	14,995	741,597	27,835	1,433,195	339,222	48,000	291,222
Charleston & Western Carolina.....	341	913,275	228,026	63,250	12,801	1,217,352	238,532	184,966	26,939	492,631	27,629	970,697	246,655	45,000	201,655
Chicago, Indiana & Southern	329	2,091,987	163,440	49,886	13,034	2,318,347	360,564	288,334	72,851	954,501	84,947	1,761,197	557,150	75,761	484,389
Chicago, Peoria & St. Louis of Ill...	255	951,510	251,576	56,939	10,334	1,270,359	199,289	303,555	56,668	532,457	42,804	1,134,773	135,586	41,000	94,586
Cincinnati Northern	248	568,039	158,556	37,720	5,266	769,581	196,960	121,889	25,412	288,642	22,373	655,276	114,305	36,472	77,833
Cleveland, Akron & Columbus	210	1,230,331	366,599	106,430	5,331	1,708,691	286,168	303,523	23,712	587,095	31,070	1,231,568	477,123	51,420	425,703
Cleveland, Lorain & Wheeling.....	194	3,067,941	201,350	58,205	142,365	3,469,861	430,359	629,641	60,379	1,193,364	52,809	2,366,552	1,103,309	97,043	1,006,266
Detroit & Mackinac	344	698,444	244,005	46,259	6,041	994,749	124,257	161,348	20,263	356,491	22,917	685,276	309,473	67,289	242,184
Detroit, Toledo, & Ironton.....	486	1,184,905	139,216	68,412	10,879	1,403,413	255,086	359,887	22,283	660,574	27,202	1,325,032	78,381	70,000	8,381
Duluth, Missabe & Northern	275	7,918,229	256,223	31,446	13,023	8,218,921	880,292	817,715	6,671	1,324,011	153,089	3,181,778	5,037,143	329,666	4,707,477
Eastern Ry. Co. of New Mexico.....	221	386,031	292,898	30,048	7,488	716,465	146,187	74,483	7,736	195,101	28,277	451,784	264,681	34,471	230,210
Elgin, Joliet & Eastern	237	1,979,790	517	45,531	22,855	2,048,693	244,830	309,762	24,632	657,571	55,321	1,292,116	756,577	102,000	654,577
Fort Smith & Western	217	388,085	171,733	22,570	64,820	647,208	142,333	107,695	7,658	186,147	25,066	468,299	178,909	12,100	166,809
Fort Worth & Denver City	454	2,375,046	1,380,875	145,814	14,544	3,916,279	595,668	494,167	68,768	1,248,265	127,034	2,533,902	1,382,377	111,752	1,270,625
Georgia R. R.	307	1,738,127	642,716	128,137	27,352	2,536,332	372,155	473,142	87,377	1,145,493	73,371	2,151,538	384,794	14,065	370,729
Georgia Southern & Florida	395	934,433	567,909	179,136	9,259	1,690,737	204,986	324,925	52,396	698,209	84,926	1,365,442	325,295	77,857	247,438
Green Bay & Western	225	337,878	127,858	38,710	2,439	506,885	98,289	84,219	3,441	149,648	20,342	355,939	150,946	19,632	131,314
Gulf & Ship Island	307	1,338,528	373,826	73,903	29,782	1,816,039	456,500	283,662	13,293	608,844	74,167	1,436,466	379,573	37,104	342,469
Midland Valley	323	691,802	195,795	33,748	9,476	930,821	215,012	152,959	16,769	287,434	40,165	712,339	218,482	23,646	194,836
Mobile, Jackson & Kansas City.....	402	916,987	292,584	49,450	18,066	1,277,087	267,013	194,810	17,920	480,034	83,343	1,043,121	233,966	28,516	205,450
Nevada & California	330	862,317	325,690	76,276	6,037	1,270,320	160,630	133,829	10,743	365,221	27,123	697,546	572,774	57,800	514,974
Pittsburg, Shawmut & Northern.....	244	631,023	69,758	13,867	9,325	723,973	136,186	284,128	10,011	272,463	31,268	734,056	10,083*	15,360	†25,443
St. Louis, Brownsville & Mexico.....	442	481,251	213,379	36,271	6,880	737,781	128,849	88,825	21,358	253,206	26,788	519,026	218,755	24,391	194,364
Santa Fe, Prescott & Phoenix	257	878,078	281,866	46,282	20,915	1,227,142	275,554	98,015	21,453	282,410	47,136	724,569	502,573	.....	502,573
Southern Pac. Co., Pacific System...	5,537	42,639,160	23,217,425	3,862,875	635,834	70,355,294	11,394,639	9,582,649	1,202,759	21,204,225	1,869,853	45,254,125	25,101,169	2,074,460	23,026,709
So. Pac. Co., Atlantic S. S. Lines...	None.	5,080,629	410,737	150,301	28,591	5,670,257	.....	.....	.....	.....	.....	5,123,796	546,461	.....	546,461
Texas Central	268	505,935	344,177	60,683	7,179	917,974	184,159	129,627	8,493	323,335	30,173	675,787	242,187	20,304	221,883
Toledo & Ohio Central	441	2,978,794	518,108	98,449	9,702	3,605,053	499,153	625,456	52,334	1,222,037	50,172	2,449,152	1,155,901	129,896	1,026,055
Toledo, Peoria & Western.....	248	695,027	295,916	41,424	5,728	1,038,095	197,231	222,176	18,256	387,034	31,410	856,107	181,988	41,200	140,788
Toledo, St. Louis & Western.....	451	2,641,054	452,918	165,956	20,405	3,280,333	411,450	412,902	114,320	1,167,719	114,804	2,221,195	1,059,138	112,000	947,138
Trinity & Brazos Valley	421	829,555	108,364	21,966	7,757	967,642	313,521	241,343	39,423	704,604	61,589	1,360,480	392,838*	18,480	†411,318

* Deficit. † Loss. ‡Credit.

Marking Company's Freight on the Burlington.

G. W. Holdredge, General Manager of the Chicago, Burlington & Quincy Lines west of the Missouri river, has issued to the agents of the road the following instructions regarding the handling of company materials:

In order to save time and labor on the part of agents, trainmen and others engaged in the handling of company materials, and to enable us to get them over the road more promptly between company storehouses, it has been decided to designate each company storehouse by a number so that in future it will be necessary only to stencil this number on the material. This will also do away with the necessity of itemizing the different articles on waybills.

The stencil to be used will be larger and plainer than a written tag, and will enable employees to identify it with less handling of packages, and the marks will also be less subject to obliteration than is the case where tags are used. It will also enable agents to immediately ship to proper designation materials which may be "over" at their stations, as the stencils will give them the proper destinations. It will also save the marking of Over and Short Reports in many cases, and will enable the company to get material into service instead of having it lie around waiting for consignees to be found. The storehouse number will invariably be stenciled or painted on the material in white paint.

Under the above plan billing will not be itemized, but will read as follows:

——— pieces of company material marked ——— in white paint.

In the space before the word "pieces" the total number of pieces, or packages, will be shown. In the space before the word "in," the storehouse number stenciled on the article will be shown.

The billing must show that the storehouse number on the material is in white paint, so that it may be designated from any other number that may appear on the material.

Each and every item less than full carload lots, consigned to one store, will positively be stenciled.

The circular contains a list of the numbers assigned to the different storehouses, which run from 2 to 102.

General Baggage Agents.

The American Association of General Baggage Agents held its annual meeting at Milwaukee last week. The President for the ensuing year is H. H. Towle of Portland, Me.; Secretary, J. E. Quick, Toronto. Next year's convention will be held at St. Augustine, Fla.

Freight Car Balances and Performances in January, 1908.

The American Railway Association Committee on car efficiency has issued bulletin No. 24, covering car balances and performances for January, 1908, the summary of which is given herewith. The Committee says:

"As the information called for is not generally compiled by the Mexican roads, the Mexican group will be omitted from the bulletin, commencing with this issue.

"Hereafter the tonnage averages will be based on the figures in the column headed 'Total Ton Miles (including company freight)'. Therefore no comparison by groups can be made with periods prior to January, 1908.

"The condition of car surplus, which noticeably affected the averages during December, was much more serious in January. The average number of idle cars reported for January was 342,170, or 16.18 per cent. of the total revenue cars.

"In addition to this number, there were a considerable number of excess bad order cars. Using 5.02 per cent. as the normal shop percentage, the excess equals .61 per cent., making a total of 16.79 per cent. of the revenue cars which should be eliminated from the averages in order to produce results comparable with previous months. Deducting this percentage of the cars for which mileage is reported, we secure an average daily mileage of 24.9 per car actually in use. This adjustment is necessarily approximate, but indicates that notwithstanding the unusual conditions prevailing during the period of this report, the car movement was quite satisfactory.

"The change in balance, which began with the appearance of a surplus continued during January, and the proportion of home cars in use increased to 71 per cent. of the total ownership. This is the highest figure of which we have any record,

FREIGHT CAR EFFICIENCY, JANUARY, 1908.

	New England.	New York, New Jersey, Del., Md., Eastern Pa.	Ohio, Indiana, Mich., Western Pa.	Virginia, W. Va., No. and So. Carolina.	Ky., Tenn., Miss., Ala., Ga., Fla.	Iowa, Ill., Wis., Minnesota.	Montana, Wyo., Neb., Dakotas.	Kansas, Colo., Okla., Ind. T., Mo., Ark.	Texas, Louisiana, N. Mex.	Oregon, Idaho, Nev., Cal., Arizona.	Canadian Lines.	Grand total.
Revenue freight cars owned	65,453	664,128	278,683	135,088	165,194	372,926	16,036	139,336	26,192	113,719	96,096	2,072,851
Average number system cars on line	49,766	466,315	204,440	92,472	115,583	288,988	5,919	97,667	15,014	67,092	71,610	1,474,866
Average foreign railroad cars on line	24,567	160,284	67,852	36,655	42,509	72,093	12,233	27,847	23,676	51,854	19,136	538,706
Total railroad cars on line	74,333	626,599	272,292	129,127	158,092	361,081	18,152	125,514	38,690	118,946	90,746	2,013,572
Excess	8,880	.....	.....	.....	.....	.....	2,116	.....	12,498	5,227	.....	.....
Per cent. railroad cars on line of total ownership: Home	76	70	74	69	70	78	37	70	57	59	74	71
Foreign	38	24	24	27	26	19	76	20	91	46	20	26
All railroads	114	94	98	96	96	97	113	90	148	105	94	97
Private cars on line	2,862	40,032	14,625	3,005	6,523	11,177	1,039	4,582	2,022	11,182	4,241	101,290
Total all cars on line	77,195	666,631	286,917	132,132	164,615	372,258	19,191	130,096	40,712	130,128	94,987	2,114,862
Per cent. of cars in shop	4.09	4.89	6.57	6.13	4.69	5.17	4.29	10.78	4.90	4.74	4.98	5.63
Number of freight engines owned	1,158	9,819	3,706	2,250	2,518	6,275	438	2,471	645	2,281	2,079	33,640
Av. cars on line per frt. engine owned	67	68	77	59	65	59	44	53	63	57	46	63
Total freight car mileage	37,883,753	433,962,939	155,439,076	73,102,729	104,734,388	288,863,237	21,311,749	83,697,986	28,974,386	120,938,037	71,438,175	1,360,346,455
Average miles per car per day	15.8	21.0	17.5	17.9	20.5	19.9	35.8	20.8	23.0	30.1	24.4	20.8
Per cent. loaded mileage	67.8	60.5	58.3	61.2	62.6	67.2	59.9	54.4	61.1	54.1	70.3	61.4
Total ton-miles of freight (inc. Co. frt.)	355,440,538	6,189,814,150	1,870,334,623	813,099,026	1,281,962,242	1,796,983,915	251,946,074	1,044,482,488	182,141,848	1,429,523,219	949,181,474	16,164,909,597
Average ton-miles (incl. company frt.): Per Car mile	9.2	14.3	12.7	11.1	12.4	13.1	12.2	12.5	12.7	11.8	13.2	12.8
Per loaded cars mile	13.7	23.6	21.9	18.2	18.0	20.2	20.5	23.0	19.9	21.8	18.8	21.4
Per car per day	147	300	231	199	255	260	447	260	291	356	322	271
Gross freight earnings	$4,177,188	$35,958,498	$10,923,811	$6,459,581	$8,816,097	$16,356,922	$2,219,357	$8,358,434	$3,176,106	$11,792,395	$5,263,050	$113,501,439
Average daily earnings: Per car owned	$2.06	$1.75	$1.26	$1.54	$1.75	$1.84	$4.46	$1.94	$3.95	$3.35	$1.77	$1.85
Per railroad car on line	1.81	1.85	1.29	1.61	1.83	1.90	3.94	2.15	2.66	3.21	1.87	1.90
All cars on line	1.75	1.74	1.23	1.58	1.75	1.83	3.73	2.08	2.53	2.93	1.79	1.81

and it is probable that during January there was a larger proportion of cars on their home lines than at any time during the preceding five years.

"As pointed out in the December bulletin, this return movement was accomplished at the expense of an unprecedented empty mileage. The proportion of empty to total freight car mileage reached 38.6 per cent. Compared with October, 1907, when the empty mileage was 27.1 per cent., there was 11.5 per cent. or 156,849,432 miles of unproductive mileage in addition to the proportion normally necessary to equalize the balance of traffic. With the exception of a few individual cases, it is unlikely that the railroads profited by the return of their cars to such an extent as to offset the expense of this empty movement, which exceeded the total car mileage of such large systems as the Pennsylvania, the New York Central, the Rock Island or the Southern-Union Pacific."

American Street & Interurban Railway Association.

The annual convention of this and the allied associations will be held at Atlantic City, N. J., on October 12, 13, 14, 15 and 16, 1908. The dates on which the different associations will hold their meetings have not been definitely decided. The exhibit of the Manufacturers' Association will be an important feature of the convention and will be located on Young's New Pier.

The Brotherhood of Railway Clerks.

This association held its biennial convention at Toledo, Ohio, June 10-13. The next convention will be held two years hence at New Orleans, La. The officers of the Brotherhood are: President, Wilbur Braggins, New Orleans; Secretary, R. E. Fisher, Kansas City, Mo. Secretary Fisher devotes all of his time to the duties of his office, and Third Vice-President James H. Riley, also of Kansas City, gives all of his time to "field work."

Car Surpluses and Shortages.

Statistical Bulletin No. 25 giving the summary of freight car surpluses and shortages by groups, from October 30, 1907, to June 10, 1908, has been issued by the Committee on Car Efficiency under date of June 10. The grand total of surpluses was 349,994 and the shortages 427, as compared with surpluses of 381,904 and shortages of 125 on May 27. In transmitting the report Arthur Hale, Chairman, says:

"The decrease in surplus, which was first noted in the report for May 13, continues, the total having dropped to 349,994 for this report, a decrease of 31,910 under the figures for May 27.

"Reports from a number of the larger roads indicate some further increase in the number of bad order cars, which will account for a portion of the decrease in surplus available cars.

"The figures, however, show that only about 20 per cent. of the decrease is accounted for by the increase in shop cars, the balance being a legitimate decrease in idle cars.

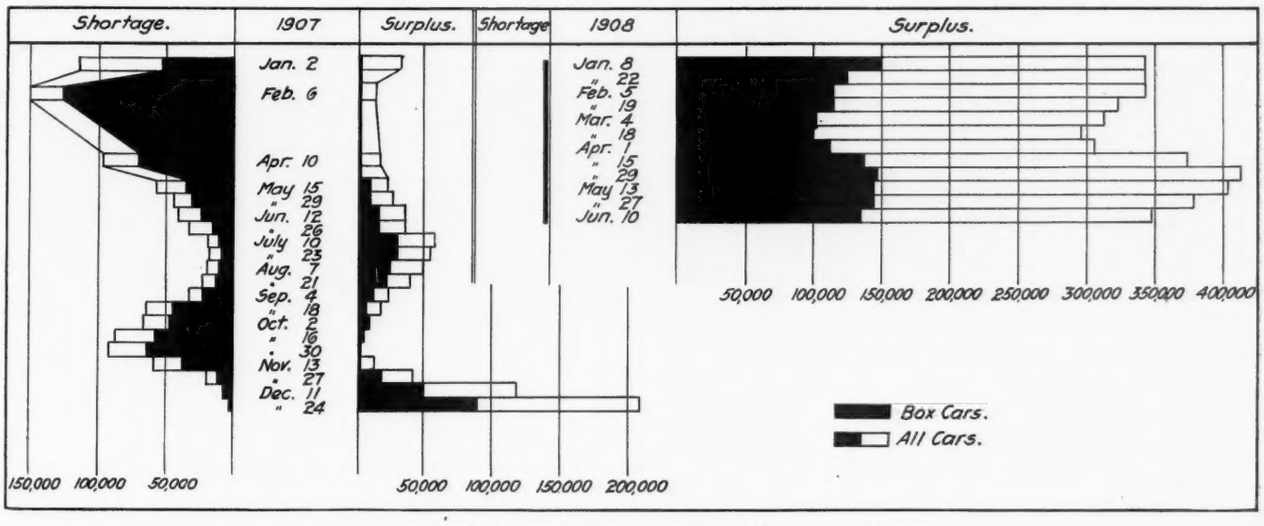
Of the total decrease, 8,955 is in box cars, and 18,951 in coal and gondolas.

"The improvement seems quite general throughout the country, the most favorable reports being those from roads in Group 2 (Eastern), 3 (Middle), and 4 (North Atlantic). Two of the largest roads in Group 6 (Northwestern) were unable by reason of washouts to give accurate reports for June 10, and repeated their figures for May 27. As the surpluses for these two roads amount to about 40 per cent. of the total for this group, the result was a reduction in the percentage of improvement shown by roads in this section." The summary for 164 roads is shown in the accompanying table.

The accompanying diagram shows graphically the surpluses and shortages of freight cars during 1907 and 1908. The figures for some of the weeks in 1907 are not available, but these figures have been estimated. Wherever dates are given in the chart for 1907, the actual figures were available. Of course, in 1908, there were car shortages in some parts of the country, and these shortages are represented by the slightly broadened line to the left of the dates in the 1908 chart.

SURPLUSES AND SHORTAGES, BI-WEEKLY, FROM OCTOBER 30, 1907, TO JUNE 10, 1908, INCLUSIVE.

Date.	Number of roads.	Surpluses. Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
June 10, 1908	164	135,742	19,078	143,744	51,430	349,994	180	11	23	213	427
May 27, 1908	160	144,697	20,075	162,695	54,437	381,904	82	13	12	18	125
May 13, 1908	163	143,822	22,949	183,041	54,722	404,534	100	33	16	10	159
April 29, 1908	159	147,971	24,350	186,742	54,542	413,605	145	42	16	64	267
April 15, 1908	153	138,065	23,811	160,205	53,689	375,770	83	7	1	55	146
March 18, 1908	160	103,509	25,122	119,205	49,206	297,042	533	151	250	73	1,007
February 19, 1908	161	113,776	30,088	134,217	44,432	322,513	697	141	249	162	1,249
January 22, 1908	161	124,622	27,328	142,338	48,292	342,580	392	132	79	135	738
December 24, 1907	158	87,714	14,740	64,556	42,300	209,310	187	81	191	265	724
November 27, 1907	160	16,246	3,645	10,028	10,429	40,348	11,908	868	2,964	2,224	17,964
October 30, 1907	161	786	600	1,285	1,275	3,946	61,592	3,546	15,987	9,632	90,757



Car Surpluses and Shortages in 1907 and 1908.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Canadian Pacific has ordered 10 ten-wheel and 10 consolidation locomotives from the American Locomotive Co.

CAR BUILDING.

The Calumet & South Chicago, Chicago, is asking prices on 15 cars.

The Northwestern Elevated, Chicago, is in the market for 20 cars.

The Chicago, Milwaukee & St. Paul has ordered four sleeping cars from the Barney & Smith Car Co.

The Duluth, Missabe & Northern has ordered 10 passenger cars from the American Car & Foundry Co.

The Chicago & Milwaukee Electric is in the market for 10 passenger cars. Bids are being asked through A. L. Drum & Co.

A State Railroad in the Far East is receiving bids up to October 30 on rolling stock. Specifications are on file at the Bureau of Manufactures, Washington, D. C., inquiry No. 2,354.

The Northern Pacific is in the market for five baggage and mail cars, five baggage cars, five second class coaches, six first class coaches, three dining cars, two buffet observation cars, two compartment sleepers and one section sleeper.

The Rio de Janeiro Tramway, Light & Power Co., which operates an electric line in Mexico City, is building at its shops in Mexico City 16 passenger cars and a number of freight cars. The motor equipment for the passenger cars has been ordered from the General Electric Co.

IRON AND STEEL.

The Missouri & North Arkansas has ordered 8,000 tons of rails from the United States Steel Corporation.

RAILROAD STRUCTURES.

Baton Rouge, La.—The Texas & Pacific, it is said, is laying out a new town to be called Addis near Baton Rouge Junction. The company is to spend $500,000 for improvements, which will include a 40-stall roundhouse, office buildings and other structures. Car yards are also to be made, and 1,500 men will be given employment in the shops when the work is finished.

Brownsville, Tex.—According to a statement credited to Major John B. Armstrong, a Director of the St. Louis, Brownsville & Mexico, plans were made at a directors' meeting last week for building a bridge across the Rio Grande to make direct connections with the National of Mexico. It is expected that contracts will be awarded for this soon and work commenced immediately afterwards.

Calvin, Okla.—See Missouri, Oklahoma & Gulf under Railroad Construction.

Cedar Rapids, Iowa.—An ordinance is being prepared under the direction of the City Council for elevating the tracks of the Chicago & North-Western; the Chicago, Rock Island & Pacific; the Chicago, Milwaukee & St. Paul, and the Illinois Central.

Chicago, Ill.—The Chicago City Railway has awarded the general contract to W. M. Crilly, 167 Dearborn street, Chicago, for a one and two-story office and car barn to be erected at Sixty-ninth street and Ashland avenue. This structure will be of pressed brick with stone trimmings and have ground dimensions of 265 ft. x 485 ft. The contract price is $300,000.

Guanajuato, Mex.—The Mexican Central is putting up a new passenger and freight station here.

Houston, Tex.—The Houston Belt & Terminal Co. is said to have definitely arranged for the location of its new passenger station on the block bounded by Texas, Prairie, Crawford and Jackson streets. Plans are now being completed.

Kansas City, Mo.—At a recent meeting of the directors, President Harman, of the Kansas City Union Depot Co., was instructed, it is said, to continue the negotiations for putting up the station building. Work is to be started as soon as the City Council grants the necessary franchise.

Memphis, Tenn.—The St. Louis & San Francisco has acquired 150 acres of land just east of Memphis for terminal yards, roundhouses and other buildings. It is said that plans have already been prepared for extensive yards.

Spirit Lake, Idaho.—Work on the new shops for the Idaho & Washington Northern here is to be begun at once. The shops are to cost $300,000 and the grading about $100,000 additional. There will be wrecking, blacksmith, machine and construction shops, also a six-stall roundhouse and some warehouses. In addition there will be two electrically operated coal wharves and bunkers. The shops will be equipped with modern machine tools and appliances. The motive power will be electricity, and each of the machines will be driven by a separate motor. The work will probably be finished in September. (May 29, p. 746.)

Superior, Wis.—The Wisconsin Central placed a contract on June 12 for the construction of the new terminal buildings to be erected in this city. The contract was awarded to Schmidt Bros. & Hill, of Superior, at about $75,000. The structures included in these plans are as follows: Passenger depot, freight depot, roundhouse, machine shop, store room, turntable and cinder pit.

SUPPLY TRADE NOTES.

The Summers Steel Car Co., Pittsburgh, Pa., has been incorporated with $80,000 capital stock by J. R. D. Huston, A. M. Neepher, W. W. Lindsay and F. P. Potter, all of Pittsburgh.

C. S. Redfield, Advertising Manager of the Yale & Towne Manufacturing Co., New York, who is spending the summer in Europe, has been elected President of the Technical Publicity Association.

The Marion Steam Shovel Co., Marion, Ohio, is completing plans for an addition to its plant, which will be about 115 x 350 ft. This addition will be an open-hearth steel foundry, and beside the one large building other smaller structures will be erected. Work will be started soon.

The Nathan Manufacturing Co., Chicago, has moved its offices from the fourth floor of the Old Colony building to suite 1,615, Old Colony building. In the new location a room has been set aside for the use of customers and friends who live out of the city where they can make their headquarters while in Chicago.

The Raymond Concrete Pile Co., New York and Chicago, has the contract for the concrete piles to be placed in connection with the foundation for the proposed bridge at the intersection of the Cleveland Short Line and Independence road, near Cleveland, Ohio. The Raymond company placed the concrete piles for the Cuyahoga viaduct last season.

The Allis-Chalmers Co., Milwaukee, Wis., reports an increase of 80 per cent. in business during May over the preceding month, comparing favorably with the average of 1907, which was the largest year in the company's history. Among orders recently received were two from iron and steel companies, these being the Pittsburgh Steel Co., Pittsburgh, Pa., and the Tennessee Coal, Iron & Railroad Co., Birmingham, Ala. These include a horizontal-vertical 4,000-h.p. rolling mill engine for the Pittsburgh company, and a two-stage air compressor capable of furnishing 5,760,000 cu. ft. of air per day, for the Tennessee company.

Bids will be received (Circular No. 448) until July 6, 1908, by the Isthmian Canal Commission, Washington, D. C., for the supply of culvert pipe, condenser tubes, dredge dipper, rails, angle bars, tie plates, track bolts and spikes, frogs, switches, switch stands, nut locks, machine and key bolts, nuts, rivets, hasps and staples, spring cotters, tacks, wrought washers, wire and rubber sleeves, hose, motor car, electric motors, steel trolleys, pump governors, steam gages, oil cans, melting ladles,

rail saws, picks, forges, lathe chuck, tinner's shears, chisels, carpenter's clamps, fids, platform scales, hinges, shower heads, electrical material, wire, friction tape, belt lacing, leather, boiler compound, fire brick, cross-ties, etc.

Toltz & McMynn have opened offices at 2014 Fisher building, Chicago. Max Toltz, who was in the engineering and mechanical departments of the Great Northern for 23 years, being finally Mechanical Engineer in charge of motive power, will make a specialty of railroad engineering work, both mechanical and civil, and can be consulted regarding any new devices, patents, etc. John C. McMynn, who has for the past 15 years been Mechanical Engineer for Robert W. Hunt & Co., Chicago, is prepared to take up the design and superintendence of steam, electric and water power plants; water plants; cement plants; testing plants, etc. The firm will make a specialty also of fuel and steam economy in plants now in operation, and will furnish estimates of possible savings and cost of obtaining them.

TRADE PUBLICATIONS.

Spokane & Inland.—The passenger department has issued a folder illustrating and describing the popular resorts and summer attractions along the lines of this road.

Steel Reinforcement Bars.—A leaflet introducing the new internal bond bar for concrete reinforcement is being distributed by the maker, Arthur Priddle, Builders' Exchange building, San Francisco, Cal.

Wire Fabric Reinforcement.—The General Fireproofing Co., of Youngstown, Ohio, has issued an illustrated catalogue showing its wire fabric reinforcement, as applied in the construction of different buildings.

Coal Handling Machinery, Industrial Railways, Etc.—The C. W. Hunt Co., West New Brighton, N. Y., has issued Pamphlet No. 081, illustrating and describing coal handling machinery, conveyors, industrial railways and other products.

Lumber.—J. Gibson McIlvain & Co., Philadelphia, Pa., have made the June issue of the *McIlvain Lumber News* their anniversary number. The concern has been in business for 110 years, and a complete history of it is the attractive feature of this issue.

Punches and Dies.—Catalogue A, being a supplement to Catalogue No. 6, has been issued by the Cleveland Punch & Shear Works Co., Cleveland, Ohio. The publication contains illustrations and descriptions of the several types of vertical punching machines and their attachments. It has 70 pages and is full of valuable data for those who are interested in tools of this type.

Dirt Cars in the Canal Zone.

In the *Canal Record* of June 3, a list showing the number and types of dirt cars now in service in the canal zone, not including the cars of the Panama Railroad, was published. This was as follows:

50-ton steel flat cars	500
40-ton wooden flat cars	1,500
12-yd. Western dump cars	300
20-yd. Western dump cars	300
40-ton steel dump cars	12
50-ton wooden hopper bottom cars	12
12-yd. Oliver dump cars	500
40-ton wooden flat cars	300
6-meter French dump cars	650
French cars, Miscellaneous	37
Total number of cars	4,111

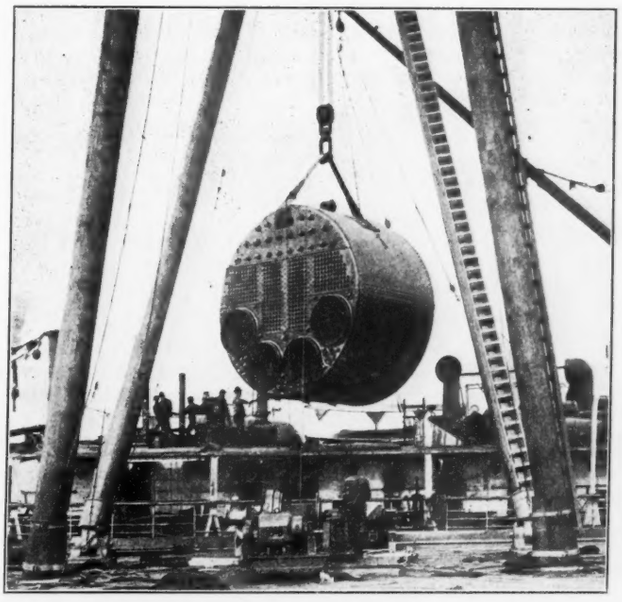
Of this number, the 500 Oliver cars were received, knocked down, between February 1 and April 30 and erected at the Cristobal shops, the last being put into service the first week in June. These are 12-yd. steel dump cars built by the Wm. J. Oliver Manufacturing Co., Knoxville, Tenn., after competitive bids, for $1,175 each. The cars are of 60,000 lbs. capacity and are 19 ft. long, 9 ft. wide and 1 ft. 10½ in., deep, inside measurements. They were designed especially for work on the Isthmus.

Electric Dock Hoist.

In the yards of the Commercial Boiler Works in Seattle, Wash., a 65-ton boiler was recently raised from the dock and placed in position in the hold of the steamship Pennsylvania in twenty minutes. The illustration shows the electric dock hoist and the boiler.

The machines in the plant of the boiler works, where marine boilers are made and ship repairs handled, are equipped with individual motor drive. To facilitate loading heavy materials it was found necessary to install electricity in the yards as well. The hoist used was supplied by the Lambert Hoisting Engine Co. and is driven by a 40-h.p. type K Westinghouse d.c. motor controlled by a drum type controller, giving nine forward and nine reverse speeds. From the drums of the hoist a ¾-in. steel cable runs to the top of the shear legs, where it is reeved through a set of blocks by which from 75 to 90 tons can be lifted. The boiler was one of the largest ever built in Seattle. The worm gear hoist, which was previously used, would have required three hours' time to raise the same load. A 15-ton boiler was recently loaded by the Lambert hoist in 4½ minutes.

The power which drives the hoist and the motors in the shop is bought from the Seattle-Tacoma Power Co., being



Electric Dock Hoist Handling 65-Ton Boiler.

transmitted by a two-phase line at 2,300 volts. It is used on the dock as direct current and in the shops as alternating current for two 50-h.p. motors driving heavy rolls, one 50-h.p. motor driving an air compressor, and various small motors, all of standard Westinghouse manufacture. A motor generator set is installed in the shop, to supply the necessary direct current for the hoist.

Electrifying German Railroads.

Electrifying of some of the railroads in Prussia will soon be undertaken, the preliminary plans being as follows:

The railroad ministry will permit the first great attempts to be made with electrical power in connection with the centrals now existing in the administrative district of Magdeburg. In the first place the short sections Güsten-Stassfurt and Güsten-Bernburg-Köthen will be arranged for electrical operation. Later, in further execution of plans, there will be a change of power on the line Magdeburg-Bitterfeld-Leipzig, and afterwards on the line Halle-Leipzig. Upon these, in themselves complete lines of road, electrical power will wholly supplant steam.

The line Leipzig-Halle has been chosen for a special reason. By the electrical operation between these two points there

will be a greater increase in the speed and frequency of the trains despatched, so that in this way Leipzig will be brought into closer connection with the western main lines. The two lines are under the district management of Halle, which has been instructed from the ministry at Berlin to make a detailed inquiry how far electrical power can be economically used in comparison with the present method of operation. It is said that the preliminary work for this statistical inquiry has already been done by the ministry, so that the administration at Halle has only to verify the results already obtained.

The most favorable factor for the economical determination of the question are the bituminous deposits (Braunkohlen) between Halle and Leipzig. This kind of coal is not considered a suitable fuel for locomotives. One electrical central will suffice for the operation of both lines, and this will be built in the midst of the coal strata. Some years ago the favorable location of these strata suggested the electrifying of the railroad between Köln and Trier, but this was abandoned.

It is said the passenger traffic will be handled in the same manner as upon the road Berlin-Lichterfelde-Ost, namely, with small trains and quick service. The express and freight trains will be despatched with electrical locomotives. The length of the two lines together amounts to 102½ miles, the line Leipzig-Magdeburg being about 80 miles and the line Leipzig-Halle 22½ miles. For the current, which will be conducted on thin wires, 10,000 volts will be required. It is calculated that the change in the system of operation will take two years.—*Consular Report.*

Railroad Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Parley Sheldon has been appointed Receiver of the Newton & Northwestern.

P. K. Soffel has been appointed Real Estate and Claim Agent of the Wabash-Pittsburgh Terminal, in charge of real estate and personal injury claims, with office at Pittsburgh, Pa.

F. B. Brown, Auditor of Freight and Ticket Accounts of the Wabash-Pittsburgh Terminal, has been appointed Auditor, in charge of the accounting and of the freight claim department. H. C. Moore has been appointed Treasurer.

Operating Officers.

F. S. Rawlin, Assistant Train Master of the Northern Pacific at Wallace, Idaho, has been appointed Superintendent of Terminals of the Southern Pacific at San Francisco, Cal., succeeding A. E. Roome, resigned.

The office of L. M. Souders, Western Superintendent of the Empire Line, has been moved from Cleveland, Ohio, to Chicago. Mr. Souders' headquarters are in the Gaff building, 234 La Salle street, Chicago, instead of 234 Lake street, as erroneously reported last week.

H. P. Timmerman, General Superintendent of the Eastern division of the Canadian Pacific, has been appointed Industrial Commissioner for the lines east of Montreal, Que., with office at Montreal. C. Murphy, Acting General Superintendent of the Ontario division, succeeds Mr. Timmerman, with office at Montreal.

C. O. Dambach has been appointed Trainmaster of the Wabash Pittsburgh Terminal, with office at Pittsburgh, Pa., succeeding F. E. Barber. F. P. Barr, Car Accountant, has been appointed Superintendent of Car Service, in charge of car service and car accounting, with headquarters at Cleveland, Ohio.

J. A. Zehner, the recently appointed General Superintendent of the Lehigh & New England, was born in 1862 at West Penn, Schuylkill Co., Pa. He is a graduate of the Normal University at Lebanon, Ohio, class of 1885, and began railroad work in the same year on the Lehigh Valley as draftsman. In 1886 he was made topographer, and the next year transitman. In 1889 he was promoted to Assistant Engineer, and four years later was made Division Engineer of the Wyoming division. On Feb. 1, 1908, he was made Division Engineer of the New Jersey and Lehigh divisions, which position he held until his appointment on the Lehigh & New England.

A. M. Smith, the recently appointed General Manager of the Coal & Coke Railway, was born in December, 1865, at Boonesboro, Iowa. He went to the High School there and in October, 1887, began railroad work with the Duluth & Iron Range. The first two years he spent in the General Manager's office, and was then transferred to the General Superintendent's office. He worked six months as a conductor and four years as Assistant Superintendent. In 1895 he became chief clerk to the General Manager of the Eastern Missouri, now part of the Great Northern. The next year he was made Trainmaster on the Great Northern, and in 1899 went into the accounting department of the Chicago & Eastern Illinois. Two and one-half years later he was made Secretary and Auditor of this company, and two years after that was appointed General Superintendent of the Pere Marquette. In 1905 he went to the Southern Railway and for the last two years has been Superintendent at Winston-Salem, N. C.

John Leppla, who was recently appointed Assistant Superintendent of the Chicago & North-Western, was born in 1871 at Medina, Wis., and went to the common school there. He began railroad work in 1884 with the Milwaukee, Lake Shore & Western. For four years he was a telegraph operator at Kaukauna, Wis., and was then promoted to train despatcher. In 1893, when the Milwaukee, Lake Shore & Western was taken over by the Chicago & North-Western, Mr. Leppla kept the position of train despatcher, and the next year was promoted to assistant chief train despatcher. In March, 1895, he was appointed chief train despatcher, and in 1902 was made chief train despatcher of the Sioux City division. Three years later he was made chief clerk to the Assistant General Superintendent of the lines west of the Missouri river. In April, 1906, he was promoted to Trainmaster of the Eastern division, and on June 1, 1908, was made Assistant Superintendent of the Black Hills division, with headquarters at Chadron, Neb.

Traffic Officers.

C. D. Turner has been appointed Southern Freight Agent of the Erie, with office at Chicago, succeeding T. M. Cunerty, transferred.

S. P. Woodside, Assistant General Freight Agent, has been appointed General Freight Agent of the Wabash-Pittsburgh Terminal, with office at Pittsburgh, Pa. R. F. Kelley, Assistant General Passenger Agent, has been appointed General Passenger Agent in charge of passenger traffic and baggage service.

J. L. West is Assistant General Freight Agent of the Missouri, Kansas & Texas, with office at St. Louis, Mo. He has not been appointed Assistant General Freight Agent of the St. Louis Southwestern of Texas, as was mentioned in these columns recently. J. E. Allen has been appointed Assistant General Freight Agent of the St. Louis Southwestern of Texas, not General Freight Agent.

Engineering and Rolling Stock Officers.

C. H. Spencer has been appointed Engineer of the Washington (D. C.) Terminal Company, with office at Washington, D. C., succeeding A. C. Shand.

W. F. Purdy has been appointed Chief Engineer of the Wabash Pittsburgh Terminal, in charge of construction and maintenance, succeeding H. T. Douglas, Jr.

R. A. Bainbridge, Assistant Division Engineer of the Canadian Pacific at Vancouver, B. C., has been appointed Division Engineer of the Esquimalt & Nanaimo, in charge of construction and maintenance, with headquarters at Victoria, B. C.

Hans Holland, formerly Engineer of Maintenance of Way of the Houston & Texas Central, and more recently in private business, has been appointed Superintendent of Maintenance of Way of the San Antonio & Aransas Pass, with headquarters at Yoakum, Tex.

H. F. Grewe has been appointed General Foreman of the

Mechanical Department of the Wabash Pittsburgh Terminal in charge of locomotive work, with headquarters at Rook, Pa. G. H. Davis, Master Mechanic of the Clarendon & Pittsford, has been appointed General Foreman of the Car Department, of the Wabash Pittsburgh Terminal, with headquarters at Rook.

OBITUARY.

William B. Leeds, ex-President of the Chicago, Rock Island & Pacific, died in Paris, France, June 22, at the age of 47. He began railroad work in 1883 on an engineering corps of the Pennsylvania Lines West, and later was Assistant Engineer of the Columbus division of the same road. In the year 1886-1887 he worked with the construction department of the Cincinnati & Richmond, now part of the Pennsylvania Lines West. Afterwards he became Engineer of Maintenance of Way of the Cincinnati division of the Pennsylvania Lines West, holding this office until 1890. From 1890 to 1891 he was Superintendent of the Richmond division. In 1891 he was elected also President of the American Tin Plate Co. and was later elected Chairman of the Board of Directors, holding this office until 1898, when the company was absorbed by the United States Steel Corporation. In 1898 and 1899, together with other financiers, he organized the National Steel Co., the American Sheet Steel Co. and the American Steel Hoop Co. On January 1, 1902, he was elected President of the Chicago, Rock Island & Pacific, holding this office until April 15, 1904.

Railroad Construction.

New Incorporations, Surveys, Etc.

ALBERTA ROADS.—Surveys are being made by the German Development Co. for a line from Innisfail, Alb., to its coal fields, about 100 miles. M. P. Bellechase, Ottawa, Ont., may be addressed.

ATLANTA, BIRMINGHAM & ATLANTIC.—Passenger service was recently started on the new branch from the main line at Manchester, Ga., northwest to Atlanta. Work is now under way on the main line which will eventually connect Brunswick, Ga., with Birmingham, Ala. (May 1, p. 623.)

ATLANTA, GRIFFIN & MACON (ELECTRIC).—This company is said to have applied for authority to issue $5,000,000 stock and $5,000,000 bonds for its proposed lines between Atlanta, Ga., and Macon, and Macon and Albany. (July 5, p. 27.)

ATLANTIC NORTHERN & SOUTHERN.—Contracts are said to have been recently let by this company to Ross & Judd and to Hans Rattenborg for an extension from Atlantic, Iowa, south. (March 13, p. 389.)

BUFFALO, ROCHESTER & PITTSBURGH.—In addition to the main line improvements near Punxsutawney, Pa., plans are being made for the elimination of grades and curves at other points, for which contracts are to be let soon. Heavy shipments of coal and ore from the opening of the new coal fields, the building of the new line north of Pittsburgh, and the addition of many manufacturing plants along the new line necessitate improved facilities on the main line.

CANADIAN NORTHERN.—The Dominion Government has agreed to subsidize and guarantee bonds for the remaining 488 miles of the branch which this company is building to Hudson Bay.

CANADIAN PACIFIC.—Grading for the double tracking from Winnipeg, Man., to Fort William, Ont., 420 miles, is about finished, and track has been laid on about 250 miles. The plans are to have all the work finished and the line opened for traffic by September, in time to carry grain from the west to the head of the lakes.

The branch from Toronto, Ont., west to Sudbury was opened for traffic June 15, when the first direct train to Winnipeg, via Sudbury, was run from Toronto. The cost of the line was $11,000,000, about $45,000 per mile, including bridges; it shortens the distance between Toronto and Winnipeg about 60 miles and saves about eight hours.

GOOSE LAKE & SOUTHERN.—See Southern Pacific.

GRAND TRUNK PACIFIC.—Foley, Welch & Stewart, who have the contract for the first 100 miles from Prince Rupert, B. C., east, have sublet some of the work as follows: Neil Keith, Winnipeg, three miles; MacDonald & McAlister, Edmonton, Alb., five miles; M. Shady, Winnipeg, three miles; Smith Brothers, Kenora, Ont., three miles, and Harston & Stanor, three miles. Other sub-contracts will be let shortly.

General Manager Frank W. Morse is now in the west letting contracts for which bids have been received on 100 miles of line from Wolf Creek, west. Bids have also been asked on an additional 79 miles further west.

GUTHRIE & INTERURBAN (ELECTRIC).—Organized with a capital of $100,000 to build from Guthrie, Okla., to a point on the Cimarron river, five miles. C. R. Renfro, F. E. Houghton, G. Crow, R. E. Overton, Guthrie, Okla., and E. C. Brown, St. Louis, Mo., are incorporators.

IDAHO NORTHERN.—With a construction force recently increased to 1,200 men, work is being rushed from Enaville, Idaho, to Murray, along the north fork of the Coeur d'Alene river. Track has been laid on about a mile north from Enaville and a connection made with the Oregon Railroad & Navigation Co., so that rails and other material can be shipped over the latter road. In about 30 days tracklaying will be begun and pushed without interruption until the track is laid into Paragon gulch, about six miles east of Murray. The rock work includes removing more than 300,000 yards and will be finished in about 30 days. The road will have easy curves and grades for the entire 33 miles between Enaville and Paragon gulch. (May 29, p. 747.)

INTERNATIONAL OF NEW BRUNSWICK.—Track, it is said, has been laid on 40 miles from Campbellton, N. B., and grading is under way south towards the international boundary. The line is eventually to extend from Campbellton to St. Leonards, on the St. John river, 110 miles. It is expected that all grading work will be finished this year.

INTEROCEANIC OF MEXICO.—The heavy grades and sharp curves of this road are to be removed gradually, and the new stretches of road so built that a change from narrow to standard gage may be made later. About eight miles of new line has just been graded and is ready for track laying from Las Vigas, Vera Cruz, west. The new line will be 1½ miles shorter than the present road.

KANSAS CITY, MEXICO & ORIENT.—Permission has been asked to issue bonds for $260,000 on the newly finished section between Sweetwater, Tex., and Benjamin, about 100 miles. It is expected to have the line finished from Sweetwater south to San Angelo this year.

LAWTON, WICHITA FALLS & NORTHWESTERN.—An officer writes that grading has been finished on the first seven miles and track laid on the line from Lawton, Okla., south to Wichita Falls, Tex., 50 miles. Other contracts are to be let soon; also for three steel bridges. J. M. Bellamy, President; Charles Orth, Chief Engineer, Frederick, Okla. (Nov. 1, p. 541.)

MEXICAN CENTRAL.—It is expected that work on the extension from Tuxpan, Jalisco, to Colima, capitol of Colima, about 45 miles, will be finished by September. There remain three bridges to be built and about five miles of track to be laid. Hampson & Smith, Mexico City, are the contractors. (March 13, p. 396.)

MEXICAN ROADS.—According to reports from Parral, Chihuahua, Mex., J. H. Hyslop, General Manager of the San Francisco del Oro Mines, Ltd., an English corporation, has been instructed to begin work on a road from the end of the company's aerial tramway to a connection with the Mexican Central, near Parral, about seven miles.

MISSOURI, OKLAHOMA & GULF.—Work will be commenced at once on the extension from Lamar, Okla., to Calvin. Contracts for the grading have been let and the contractors are obliged to complete it in 60 days. Contracts have also been let for a bridge across the Canadian river at Calvin.

NEBRASKA ROADS.—H. E. Owen, of Norfolk, Neb., is quoted as saying that a line will probably be built this summer to connect Yankton and Norfolk.

RIO GRANDE, SIERRA MADRE & PACIFIC.—President Nickerson

is quoted as saying that work on the line from Terrazas, Chihuahua, Mex., west to a point on the Pacific coast will soon be resumed. (May 29, p. 747.)

Sioux City & Des Moines (Electric).—Surveys were previously made from Sioux City, Iowa, to Lake City; additional surveys are now being made by E. G. Killey from Lake City south through Lanesboro, east from Churdan and Paton to Boxholm, thence south via Beaver, Perry and Panther to Adel, where a connection is to be made with the line from Red Oak into Des Moines. The line is projected by residents of Perry.

Southern Pacific.—The Goose Lake & Southern, recently incorporated to build 406 miles of railroad from Goose Lake, Cal., south to Alturas, from which point there are to be two branches, both continuing in a southwesterly direction to connections with the Southern Pacific at Vina and at Cottonwood, is said to have recently started making surveys for the proposed lines. (June 5, p. 47.)

Vincennes, Centralia & St. Louis Transit.—Incorporated in Illinois with $30,000 capital to build an electric line from a point on the eastern boundary of Illinois, in Lawrence county, opposite Vincennes, Ind., through the counties of Richland, Clay, Marion, Clinton Bond, to a point in St. Clair or Madison counties opposite St. Louis, Mo. General offices are at 705 Isabella building, Chicago. The incorporators include M. A. Peoples, J. J. Burns, Clyde F. Burns, Dennis O'Connor and J. E. Burns, all of Chicago. Burns & Co., 705 Isabella building, Chicago, are retained in a consulting capacity and will have charge of construction and let all contracts.

Railroad Financial News.

Baltimore & Ohio.—Harris, Brown & Sons, Baltimore, Md., and the Guaranty Trust Co., New York, have bought $2,072,000 prior lien 3½ per cent. bonds of 1898-1925, $4,025,000 first mortgage 4 per cent. bonds of 1898-1948, and $1,513,000 Southwestern division 3½ per cent. bonds of 1899-1925. No more bonds can be issued under the prior lien and Southwestern division mortgages, and no more of the first mortgage 4 per cent. bonds can be issued before July, 1909.

Chicago Great Western.—The English Four Per Cent. Debenture Stockholders' Committee, Robert Fleming, Chairman, has issued a circular containing the report of Robert Fleming, who recently returned to London after spending two months in the United States. Mr. Fleming traveled over the main line of the Chicago Great Western from Chicago to Omaha, Neb., and from Kansas City, Mo., to St. Paul, Minn., and reports that he found the roads in fair condition. Horace G. Burt, who was President of the Union Pacific from 1898 to 1904, has been retained by the committee to inspect the Chicago Great Western and report on its physical and financial condition. The 4 per cent. debenture stockholders are asked to deposit their holdings with Robert Benson & Co., London, England, at once.

Chicago, Milwaukee & St. Paul.—The Chicago, Milwaukee & St. Paul has been given an undivided half interest in the property on the south side of Carroll avenue, Chicago, extending 99 ft. west of Canal street, 81 x 253 ft., and the right of way formerly owned by the Pittsburgh, Cincinnati, Chicago & St. Louis from a point east of Halsted street to the alley east of North Western avenue. The property was purchased from the Pittsburgh, Cincinnati, Chicago & St. Louis for $400,534. For a further consideration of $103,005 the Panhandle conveyed to the St. Paul road an undivided one-half interest in the fixtures, structures, bridges and tracks. In the record of the deeds filed on June 20 the St. Paul road is given a joint interest in the real and personal property as described, with an equal right to its use.

Cleveland, Cincinnati, Chicago & St. Louis.—The directors, at a meeting held June 17, decided not to pay any dividend on the $47,056,300 outstanding common stock for the half year ending this month. The annual rate has been 4 per cent. since 1902.

Cleveland, Painesville & Eastern (Electric).—A mortgage securing $5,000,000 refunding and extension 40-year 5 per cent. bonds of May 1, 1908-1948, has been made to the Cleveland Trust Co., and bonds are issueable as follows:

Reserve to retire underlying liens	$1,631,000
For immediate extensions and improvements	369,000
Reserved for future additions and extensions	3,000,000

Denver & Rio Grande.—Shareholders of this company and of the Rio Grande Western are to meet on July 23 to vote on the proposed consolidation of these two companies under the laws of Colorado and Utah.

Galveston Terminal.—The Railroad Commission of Texas has given the Galveston Terminal permission to issue $1,106,000 first mortgage 6 per cent. 30-year bonds of March 1, 1908-1938, and also $25,000 stock.

Lake Erie & Western.—The directors have passed the semi-annual dividend on the $11,840,000 outstanding preferred stock. This stock is 6 per cent. non-cumulative preferred, and 1 per cent. was paid last January. During the three previous years the annual rate was 3 per cent.

Leavenworth, Kansas & Western.—See Union Pacific.

Louisville & Nashville.—A semi-annual dividend of 2½ per cent. on the $60,000,000 outstanding stock was declared June 18, reducing the annual rate from 6 per cent. to 5 per cent.

Nashville Railway & Light.—This company will cancel its refunding and improvement mortgage dated July 2, 1906, and file a new mortgage dated July 1, 1908, securing $15,000,000 refunding and extension mortgage 5 per cent. bonds. Of these bonds, $2,000,000 can be issued at once, the balance being reserved to retire $6,000,000 underlying bonds and to pay back the company 80 per cent. of the cost of future additions to its property. The stockholders are offered $1,425,000 of these bonds. Part of the proceeds of the sale are to be used to retire $1,000,000 collateral trust notes, which matured July 1, 1908.

New York City Railway.—William A. Read & Co., New York, are offering $3,500,000 one-year 5 per cent. receivers' certificates of the New York City Railway and the Metropolitan Street Railway, due June 15, 1908, at 100¼, yielding 4.75 per cent. These certificates must be paid in full before the issue of any additional certificates constituting a lien on either of the properties.

New York, New Haven & Hartford.—A final decree enjoining this company from holding any stock in the various electric railway companies in which it had an interest has been entered by Judge Rugg, of the Massachusetts Supreme Court.

Philadelphia Rapid Transit.—A proposed ordinance has been submitted to the City Council of Philadelphia, Pa., authorizing the Philadelphia Rapid Transit to make a mortgage securing $5,000,000 bonds, half of which may be issued at once.

Pittsburgh, Cincinnati, Chicago & St. Louis.—See Chicago, Milwaukee & St. Paul.

Rio Grande Western.—See Denver & Rio Grande.

Seaboard Air Line.—Sutro Bros. & Co., New York, are offering $3,000,000 6 per cent. receivers' certificates of June 15, 1908-June 1, 1911, at a price to yield 6 per cent.

Spokane, Portland & Seattle.—This company, which is jointly operated by the Northern Pacific and Great Northern, and which on April 4 increased its authorized stock from $5,000,000 to $25,000,000, has made a mortgage securing $100,000,000 bonds of 1908-1958, bearing interest as the directors shall from time to time determine. Of these bonds $40,000,000 may be issued from time to time as portions of work on the road are completed, and $60,000,000 are to be reserved until this mortgage shall become a first lien on the property of the company.

Union Pacific.—This company has taken over the property of the Leavenworth, Kansas & Western, which runs between Leavenworth, Kan., and Miltonvale, a distance of 166 miles, and will hereafter be called the Leavenworth-Western branch of the Kansas division of the Union Pacific.

West Side Belt.—This road has been put in the hands of F. H. Skelding and H. W. McMasters, as receivers, who are also the receivers of the Wabash Pittsburgh Terminal.